The potential for Environmental Impact Assessment (EIA) in Iran's Water Management

Thesis submitted in accordance with the requirement of the University of Liverpool for the degree of Doctor in Philosophy

by

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Publications

The following is a list of publications associated with this research, and their location within this thesis, where applicable.

Khosravi. F, Jha Thakur, U. Fischer. TB. 2018. "The role of Environmental Assessment (EA) in Iranian water management". Journal of Impact Assessment and Project Appraisal. http://dx.doi.org/10.1080/14615517.2018.1526998.

(This paper corresponds to **Chapter 5 and Chapter 8** of the thesis.)

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(This paper corresponds to **Chapter 6 and Chapter 7** of the thesis.)

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Other publications by the author:

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Khosravi. F, Fischer. TB, Jha Thakur. U. 2019. Multi-criteria Analysis for Rapid Strategic Environmental Assessment in Tourism Planning. Journal of Environmental Assessment Policy and Management. DOI: 10.1142/S1464333219500133.

Conference presentations

Khosravi. F, Fischer. TB, Jha Thakur, U. 2016. Urmia Lake and water development. In International Association of Impact Assessment. Water Lincoln. 1 - 2 September 2016, Lincoln, United Kingdom.

Khosravi. F, Fischer. TB. 2019. Environmental consideration in Iranian water management. In International Association of Impact Assessment 2019. 29 April 2 May 2019. Brisbane, Australia.

Abstract

There is a growing international body of literature on Environmental Impact Assessment (EIA) effectiveness, but to date little EIA-related research has been undertaken in Iran despite of its inception in 1994. This research therefore aims to evaluate Iran's EIA system, examine its effectiveness and provide recommendations to enhance it. In doing so the first section of this research undertakes an evaluation of the Iranian EIA system, focusing on EIA legislation, administration and processes. This research then examines EIA effectiveness in Iran by looking at water management in the Urmia Lake Basin (ULB). ULB was used as a case study area to investigate the extent to which EIA is delivering environmental protection within the water sector in Iran. In doing so, an EIA effectiveness framework is developed and applied for assessing the extent to which EIA has been effective in the ULB. The research helps in establishing that in Iran, environmental consideration is absent above the project level but even for EIA, the activities are rather restricted. EIA is not able to address and mitigate the negative effects of extensive water exploitation through dam building. Based on the findings, some recommendations are provided in the last section of this research. These were further developed in consideration of EIA reviews undertaken in other countries and opinions of Iranian EIA experts were also incorporated which were collected through semi-structured interviews.

This research contributes to academic literature in three important ways: First, it provides a thorough review of the Iranian EIA system. Second, it confirms that EIA is not procedurally and substantively effective by examining EIA effectiveness in Iranian water management sector. It also reveals how contextual factors can constraint EIA effectiveness in Iran. Finally, it provides recommendations to improve Iran's EIA system by evaluating the feasibility of adopting these 'recommendations' within Iran, taking into consideration the contextual factors of the country.

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1 Introduction to the research

This introductory chapter contains seven sections. The first section sets out the context of the research which is about water crisis due to over exploitation, and the potential role of Environmental Impact Assessment (EIA) in combating the water crisis. It is followed by the significance of EIA effectiveness, background of EIA and its effectiveness in Iran. Section four presents the research aim and objectives, followed by a summary of research methodology. An outline of the remainder of the thesis is presented in section six and finally a summary of the chapter is provided in last section.

1.1 Setting the context of Research

1.1.1 Water crisis in Iran

Water is essential for agricultural production and food security. Nevertheless, significant parts of the world are struggling with water scarcity (Figure 1.1) (FAO, 2016). Water scarcity occurs when water supply is insufficient to meet water demand (FAO, 2017) including environmental flow requirements (Fraiture et al. 2010). Iran is prominent in the vulnerability of its water resources. The World Bank (2017) reported that Iran has higher water withdrawal to availability ratios than elsewhere in the Middle East and North Africa. As Figure 1.1 shows, the country is situated in a region of growing water scarcity (Michel, 2017). Agriculture is largest water user, with an estimated 70 percent of global water withdrawals (Procházka et al., 2018). However, this ratio can reach as much as 95 percent in some developing countries (FAO, 2017). 92 percent of water withdrawal in Iran is consumed by the agricultural sector (Karandish and Hoekstra, 2017).

Many of irrigation's negative environmental impacts arise from the dam building and diversion of water away from natural aquatic ecosystems, such as rivers, lakes, and other groundwater-dependent wetlands. These negative impacts include salinization, channel erosion, declines in biodiversity, introduction of invasive alien species, reduction of water quality, genetic isolation through habitat fragmentation, and reduced production of floodplains and inland and coastal

fisheries (Bunn and Arthington, 2002; Pimentel et al., 2004; MEA, 2005; Khan et al., 2006; Falkenmark et al., 2007; Fraiture et al. 2010).

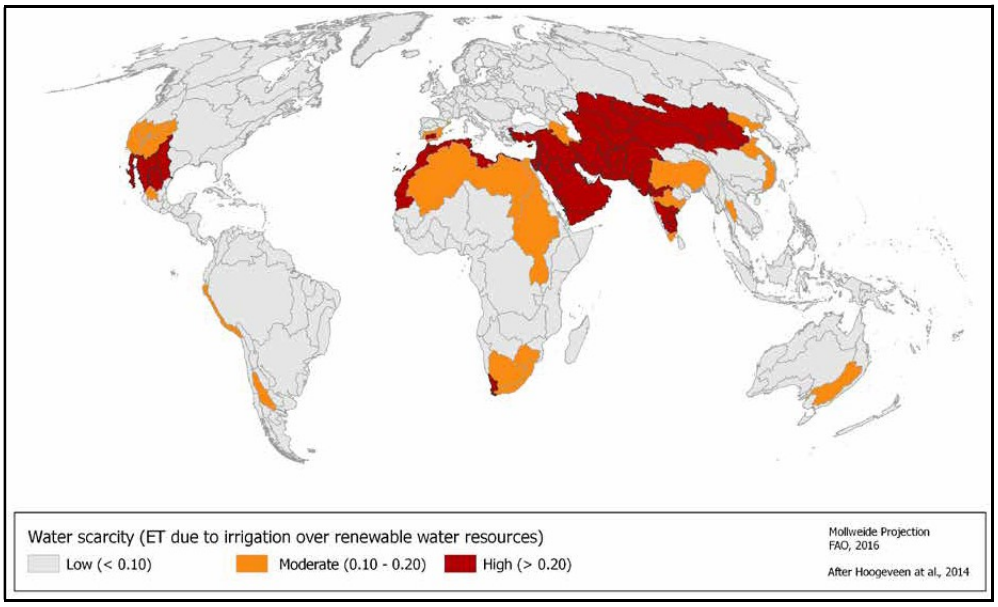

Figure 1.1. Global water scarcity due to irrigation (Hoogeveen et al, 2015; FAO 2016)

Iran ranks third in the world with respect to the number of dams it has under construction, and yet there are drying water bodies that are the result of aggressive human development and expanding regional economies (Madani, 2014). Dam building supports the Iranian hydraulic mission to store water in reservoirs in order to support agricultural activities, increase power generation and secure urban water supplies (Madani, 2014). The number of dams in the past two decades has increased by 10 times (Rouhani, 2011). Lakes and wetlands such as Urmia, Hamoun, Gavkhouni, Parishan (Ghazali 2012) and Shadegan (Davtalab et al., 2014; Kaffashi et al., 2011; Sima and Tajrishy 2006) have deteriorated due to the anthropogenic effects of short-sighted development projects. It is ironic that the collapse of Urmia Lake and other Iranian water bodies comes in the country where the Ramsar Convention was signed. As a pioneering inter-governmental treaty for conservation and sustainable use of wetlands, the Ramsar Convention (1971) envisaged action by both national governments and international co-operation.

1.1.2 Potential role of EIA in combating Iran's water crisis

EIA is one of the most widely used tools across the world which helps in incorporating environmental considerations into the decision-making process. This lends it as a potential tool in combating the water crisis problem in Iran. In this context, Madani (2014) suggest that water management in Iran should shift from structural solutions (e.g., dam construction, water diversion, using irrigation sensors) to non-structural solutions including EIA, regulations, taxation, monitoring to prevent serious environmental degradations.

Rahmati (2014) presents an overview of variety of EIA projects reviewed by Iran's Department of Environment (DoE) between 1997 and 2012, illustrated in Figure 1.2. Rahmati provided useful analysis in his paper for the period from 1997 to 2012, but the data is not readily available nor has the study been updated. Statistics show that dam constructions were the most frequent development projects, with 254 dams planned for construction in Iran over 12 years. However, the question remains whether to what extent is EIA an effective environmental management tool in Iran?

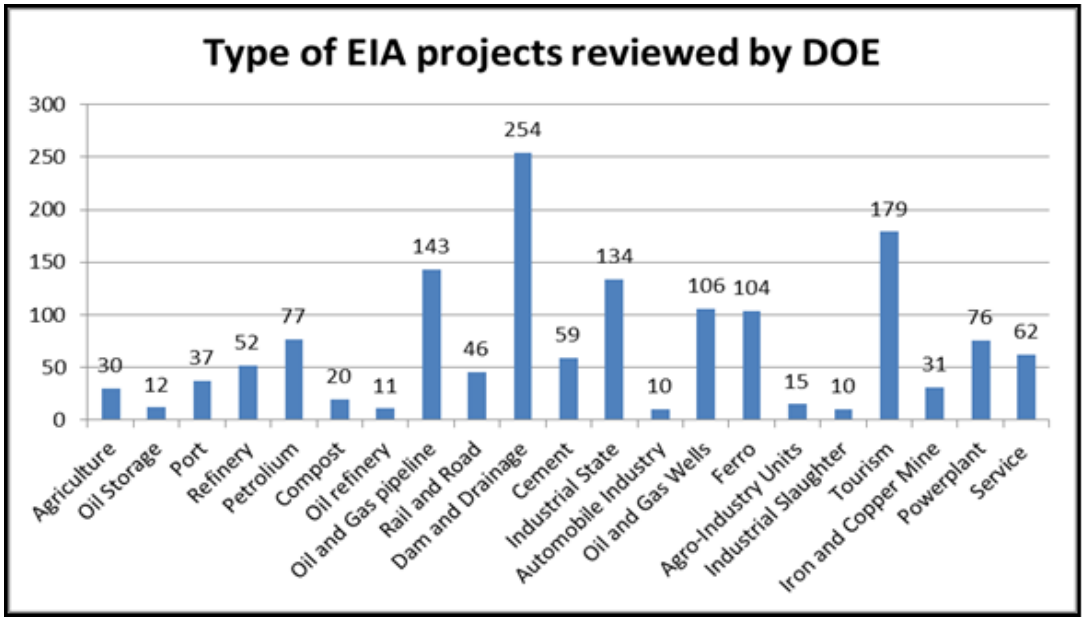

Figure 1.2. Type of DoE Reviewed Reports 1997-2012 (Rahmati 2014)

1.1.3 Urmia Lake Basin as a study area

This research uses the Urmia Lake Basin (ULB) as a case study area to explore how EIA in water management can be better facilitated. Urmila Lake is one of an increasing number of drying saline

lakes around the world as a result of unsustainable water use and climate change (Ravilious 2016). This similar scenario is happening in terminal lakes located on nearly every continent due to overuse and drought (Weiss 2018). Vanishing of the Aral Sea in Central Asia is a catastrophic example of what can happen to inland waters (Weiss 2018).

This trend is worrying, given the wide range of social, ecological, and economic impacts that can result. When saline lakes are severely desiccated, they become sources of fine dust that harm human health and agriculture (Griffin 2004; Micklin 2007). Impacts have been particularly well documented at the Aral Sea, where 12,700 km^2 of lake bed was exposed due to agricultural water withdrawals (Crighton et al., 2011; Indoitu et al., 2015; Wurtsbaugh et al., 2017). Another example of drying saline lake is Owens Lake in the USA. Due to these health issues, the city of Los Angeles will spend US$ 3.6 billion over 25 years on mitigating the dust from the dry bed of Owen's Lake - more than the value of the diverted water (Great Basin Unified Air Pollution Control District Plans, 2016).

Urmia Lake is another example of a lake that is disappearing in the Middle East. The Lake is located in the north-west of Iran and is the largest saline lake in the Middle East. It is the main habitat for the endemic Iranian brine shrimp, *Artemia urmiana*, and is a protected aquatic environment (Karbassi et al., 2010). The area has been registered under the Ramsar Convention as being of international importance for birds. Despite the unique characteristics of the lake, it has undergone severe environmental changes. The current status of Urmia Lake is catastrophic, and continuation of the lake's retreat could lead to yet another major environmental tragedy similar to the fate of the nearby Aral Sea in Eurasia (UNEP, 2012; Small et al., 2001; AghaKouchak et al., 2015). The Lake's volume was at a record low in 2014, approximately 80% less than in 1972. The extent of Urmia Lake's shrinkage in the four decades since 1972 is illustrated in Figure 1.3.

ULB is facing substantial challenges, and it is crucial to develop an understanding of the reasons and ways to address them. Over-exploitation of water is seen as the main driver of Urmia Lake's desiccation (AghaKouchak et al., 2015). The primary anthropogenic driver for the drying of the lake is irrigation expansion (Khazaei et al., 2019) through damming of the rivers feeding the lake and

pumping of groundwater by nearly 90,000 wells within the basin. According to the Urmia Lake restoration plan, there are 53 operational dams in ULB, 9 are being built and 27 are in their design stage (ULRP, 2015).

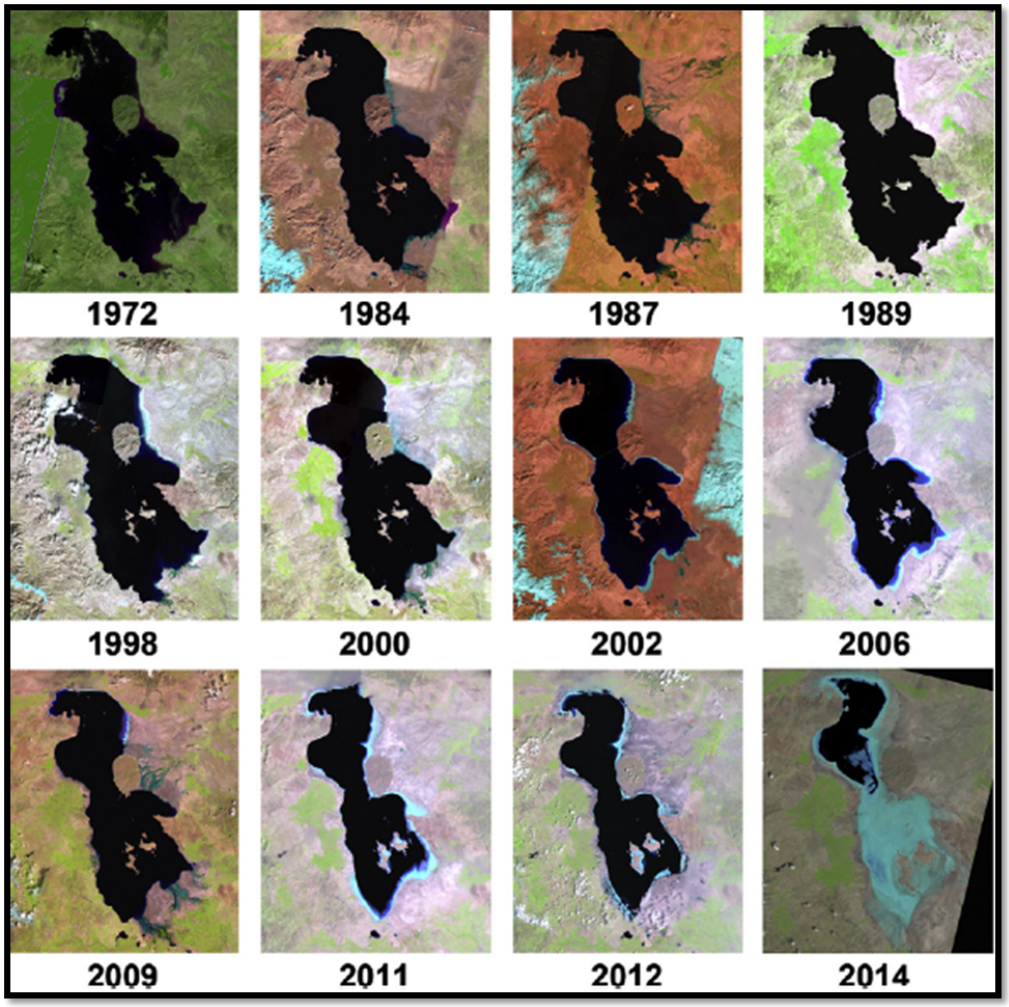

Figure 1.3. Changes in area of Urmia Lake from 1972 to 2014

Derived from LandSat imagery (AghaKouchak et al., 2015)

Water management issues of ULB have been researched from various perspectives (See Ahmadaali et al. 2018; AghaKouchak et al. 2015; Govarchin Ghale 2018; Shadkam 2017; Soudi et al. 2017). However, to date no research has been conducted on the consideration of environmental issues during water resource planning processes (Khosravi et al., 2018). EIA may serve as a tool to consider and mitigate environmental impacts of dams and subsequent developments in the planning process. However, it needs to be questioned whether EIA can deliver environmental protection effectively in this area and help prevent further shrinkage?

These questions may be answered by looking at historic events, determining how many dams have EIA reports and EIA approval, and assessing the quality of these reports. Reviews of associated EIA reports can help us to identify the kinds of impacts considered and the extent to which cumulative impacts of dams have been taken into consideration. In other words, to what extent EIA as an environmental management tool has been worked effectively in Iran?

1.2 Background of EIA and its effectiveness

EIA as an environmental management tool aims to steer the behaviour of actors towards greater environmental awareness, leading to the incorporation of environmental values in proposed activities and plans (Arts et al., 2012). EIA has been developed as a tool for environmental management for 40 years (Villacreses et al., 2017), and is now globally recognised and implemented as a decision-making support instrument in project planning (Fischer and Jones, 2016).

EIA was first introduced into law in the late 1960s, in the form of the US National Environmental Policy Act (NEPA) (Arts et al., 2012). In the late 1980s, EIA legislation was adopted in the EU in the EIA Directive (Gilpin, 1995; Rozema, 2014). This may be seen as the inception of EIA across Europe. Currently, over 120 countries have legally adopted EIA as a decision-support tool (Glasson et al., 2012; Rozema, 2014).

An early attempt to take a global look at the effectiveness of EIA was coordinated by the International Association for Impact Assessment (IAIA) and culminated in the International Effectiveness Study (Sadler, 1996). According to this study effectiveness was defined as "*whether EIA works as intended and meets the purpose for which it was designed*" (Sadler, 1996, p.37; Bond and Morrison-Saunders, 2013, p.44). Therefore, in order to work effectively, EIA results need to underpin environmental management of the project. Otherwise, EIA has been treated as a way of obtaining planning permission (Arts, 1998 p.1; Jha-Thakur, 2006, p.3). This section has been elaborated in Chapter 3.

1.3 Background of EIA and its effectiveness in Iran

Determining whether an EIA process is 'effective' is a shared goal for academics, investors and policy makers (Bond and Morrison-Saunders, 2013; Khosravi et al., 2018). Professional literature offers several studies on the effectiveness of EIA in developed countries, but little on developing countries. However, there are a few recent studies in developing countries (Salim and Kabir, 2013) such as in South Africa (Sandham and Pretorius, 2008), Egypt (Badr et al., 2011) and Sri Lanka (Hapuarachchi et al., 2016).

It has been over 20 years since EIA was formally introduced in Iran and no research has reviewed the EIA system in that country (Khosravi et al., 2019a). It is time to examine the state of the Iranian EIA system to identify EIA weaknesses and understand how to improve the effectiveness of EIA. Consequently, one fundamental objective of this research is to examine the role of EIA in Iran, and whether it delivers environmental protection or is applied merely as a mandatory checklist to smoothen the consent procedures of project proposals. This research focuses on the investigation of EIA effectiveness in the planning process, within the context of water management in Iran.

1.4 Aim, objectives and research questions

The primary research aim is to **explore the role of Iran's EIA system and its effectiveness in facilitating Iranian water management sector**.

In order to achieve this aim, four objectives have been formulated:

1. To review the status of the EIA system in Iran and identify its strengths and deficiencies;
2. To develop a criteria framework for assessing EIA effectiveness criteria;
3. To examine the effectiveness of the EIA in the study area on the basis of the criteria framework developed;
4. To develop recommendations and test its feasibility for enhancing EIA effectiveness in Iran.

Based on the objectives, eight questions have been formed and are listed in Table 1.1.

Table 1.1. The relationship of objectives and research questions

Objectives	Research questions
1. To review the status of EIA in Iran and identify its strengths and deficiencies.	1. What is the status of EIA system in Iran in terms of legislation administration, and process?
	2. What are the criteria to review the Iran's EIA system?
	3. What are the strengths and deficiencies of Iranian EIA system?
2. To develop a criteria framework for assessing EIA effectiveness criteria	4. What are EIA effectiveness criteria?
	5. What criteria should be taken in to consider in reviewing EIA effectiveness of ULB based on Iran's context?
3. To examine the effectiveness of the EIA in ULB	6. What is the current status of EIA in ULB?
	7. To what extent is EIA effective in water developments in ULB?
4. To develop recommendations and test their feasibility for enhancing EIA effectiveness in Iran	8. What should be done to improve EIA effectiveness in Iran and water management sector?

1.5 Summary of research methodology

This section describes a summary of the methodology employed in this research, which has been designed to answer the research objectives and questions formulated in the previous section. The methods selected in this study are very typical of qualitative research, and include: Semi- structured interviews, Document analysis, Observation (see Chapter 2).

1.5.1 Objective One

Objective One is concerned with the status of the EIA system in Iran. A literature review does not provide a complete picture due to dearth of literature about Iran's EIA system. Semi-structured interview are to deepen understanding of different aspects of an EIA system (legislation, administration, and process) and will be conducted with EIA actors at a national level.

1.5.2 Objective Two

Objective Two is to formulate a set of criteria used to examine EIA effectiveness in ULB. These criteria are derived from literature reviews of EIA effectiveness, international EIA effectiveness criteria, and the status of the Iranian EIA system as revealed by the semi structured interviews from previous objective.

1.5.3 Objective Three

This research then examines EIA effectiveness in Iran by looking at water management in the ULB. The effectiveness of EIA in ULB is examined using a document analysis, site visit and complemented by a semi-structured interview method that provides answers to all EIA effectiveness criteria in the framework.

1.5.4 Objective Four

Objective Four is achieved through recommendations made to enhance EIA's effectiveness on the basis of Iran's contextual factors. Most recommendations for developing countries take inspiration from developed countries and fall short in their efforts to adapt to the target country. To achieve this objective, the feasibility of provided recommendations is assessed to adapt them to the country's contextual factors.

1.6 Structure of the thesis

The structure of the thesis is summarised and described in Table 1.2. The work has broadly been categorised into five sections. Section one is the introduction to the research area along with its background. The research methodology is discussed in detail within this section. Section two provides the theoretical framework for EIA effectiveness and water issues in Chapter 3 and 4. Section three constitutes the Iran's context and it aims to establish how EIA works in the water management sector. It covers the existing literature about EIA within Iran and the EIA role within the water management sector in Iran in Chapter 5 and 6. Section four consist of empirical nature of work and Chapters 7, 8 and 9 will cover this empirical section. In this section, the focus is narrowed down to the EIA system and its effectiveness in the Iran's context. Section five consists of recommendations that are provided to improve EIA system in Iran in Chapter 10. The conclusions drawn from the study are presented in Chapter 11.

Table 1.2. Structure of the thesis

Sections	Nature
Section 1 Introduction	**Chapter 1: Introduction** This chapter provides a background to EIA, the rationale for this research, research aim and objectives, research methodology and an outline of the remainder of the thesis.
	Chapter 2: Research Methodology This chapter details the research methodology, including the research methods and the rationale for their selection. The empirical basis of this thesis will be a review of the Iranian EIA system and an evaluation of the EIA effectiveness in the Urmia Lake Basin.
Section 2 International literature review	**Chapter 3: Literature on EIA and its effectiveness** This chapter provides a theoretical framework of EIA system components and EIA effectiveness, and investigates four core concepts: EIA effectiveness definition, effectiveness dimensions, EIA effectiveness criteria, and contextual factors.
	Chapter 4: Overview of water and environment This chapter starts with an overview of water use in different sectors and how water withdrawal contributes in water scarcity around the world. It also provides the impacts of dams on environment, lake shrinkages and the role of EIA in reducing the effect of dams on the environment.
Section 3 Iranian literature review	**Chapter 5: Literature on water management in Iran** This chapter is devoted to the existing literature review about water management in Iran. This chapter also introduces the Urmia Lake Basin as the case study area, water developments in the basin are briefly discussed and their EIA studies are explored. The Urmia Lake water management plan is introduced, and environmental consideration of plan is reviewed. Three case studies are also explained in this chapter.
	Chapter 6: EIA in Iran: A literature review This chapter starts with reviewing the Iranian EIA literature, the current situation of Iranian EIA process and briefly describes EIA regulation within water developments.
Section 4 Results and discussions	**Chapter 7: Empirical Evaluation of Iran's EIA system** In the first empirical chapter of the thesis, the components of Iran's EIA system including legislation, process and administration are reviewed against the adapted criteria using data collected through a combination of a literature review, and semi-structured interviews.
	Chapter 8: Empirical examination of EIA system in Iran's water management sector This is the second main empirical chapter of the thesis. EIA effectiveness of studies in the basin are critically analysed. The analysis is based on the EIA effectiveness criteria presented in Chapter 2; and the investigation consists of an analysis of EIA studies, site visit and semi-structured interviews with EIA actors so as to answer all EIA effectiveness criteria.
	Chapter 9: Evaluating EIA effectiveness in Iran: Some international comparison This chapter presents a discussion on EIA quality and the interviews in the two empirical chapters 7 and 8.
Section 5 Conclusions	**Chapter 10: Recommendations to improve EIA system in Iran** The first section of this chapter provides some recommendations to enhance effectiveness of EIA in Iran and Second section tests the feasibility of the recommendations based on the Iran's contextual factors.
	Chapter 11: Conclusion and future research This chapter concludes by determining whether the four research objectives have been achieved, describes the main contributions of this research to academic literature and also provide some recommendations for further research.

1.7 Chapter summary

This chapter has set the agenda of the research. It started by setting the context of the research. Water crisis in Iran was introduced and the potential of EIA in combating water issues was discussed. The chapter further presented the overall aim and the four objectives of the study. To achieve the aim and objectives of the study, the research is broadly divided into five sections which include a) introduction; b) international literature review; c) Iranian literature review; d) results and discussions and finally e) conclusions.

2 Methodology

This chapter presents a detailed description of the research design and the methodology adopted for the research. In doing so, the chapter is divided into eight sections. It starts with a research design; this is followed by a brief introduction to the quantitative and qualitative research approach. The third section introduces the case study and it is followed by the research methods that have been used. A description of the four-step research strategy that has been adopted for this work is presented in the fifth section, followed by a description of data analysis. The ethical issues considered are highlighted in the seventh section and a summary of the chapter is presented in the final section.

2.1 Research design

Several decisions had to be made at the start of a research project so as to ensure the research is effective and valid. O'Leary (2004, p.10) offers a framework of useful questions to ask at the start of the research process. These were adapted for this research as follows:

1. **How do I understand the problem?** EIA is a practical activity applied to different aspects of the environment. Evaluation of EIA effectiveness could only be done through exploratory research, therefore, an empirical approach was chosen.

2. **What type of data needs to be collected?** EIA is a complex problem that is grounded in human behaviour and produces physical, ecological and socio-economic effects. Qualitative data is most suited to understanding complex phenomena. This is discussed further in Section 2.2 below.

3. **How should this data be collected?** As a complex phenomenon, EIA may be studied from several perspectives. This research chose to use multiple methods to collect data from different sources; including three of the methods suggested by O'Leary, namely interviews,

document analysis and observation. These methods are described further in Section 2.4 below.

4. **How should the data be analysed?** Thematic analysis was chosen due to the qualitative nature of the data and the complexity of the inferences that should be made. There was no quantitative data for statistical analysis to be applied. Data analysis is discussed in more detail in Section 2.6 below.

2.2 Research approach

Three approaches are widely discussed in research methodology literature review: quantitative, qualitative and mixed methods (Creswell, 2009; Bryman, 2012; Saunders et al., 2016). According to Yilmaz (2013), quantitative studies often seek to test existing theory, whilst qualitative studies tend to be more exploratory in nature particularly where the literature and underpinning theory is limited. Quantitative research is mainly based on collecting and working with structural data that can be numerically and statistically analysed (Bryman, 2012). However, qualitative data is not in numeric form but in texts, narratives, or observations (including pictures and video) (Yoshikawa et al., 2008). Mixed methods research is referred to as the third research paradigm (Denscombe, 2008) and it is a combination of both the quantitative and qualitative research method which is considered and suitable in achieving the objectives of a research project (Matthews and Ross, 2010). The fundamental objective of this research – reviewing the Iranian EIA system and its effectiveness – is a relatively new subject in Iran, and so there is a dearth of available literature and theory. Consequently, this research is largely exploratory in nature, therefore, a qualitative research method was chosen as being more appropriate.

2.3 Case study

This research adopts a case study methodology due to its advantages of enabling holistic and in-depth investigation of social phenomena and the capacity to involve important context conditions in the analysis (Yin, 2009; Clement, 2015). Case studies are especially valuable to investigate 'how'

research questions and for evaluation, and investigation of social complexity (Yin, 2009; Clement, 2015). Case study minimizes travel, ease access, reduce costs and make the research doable (O'Leary, 2004). Multiple case study design was selected over single case in order to draw more powerful conclusions (Yin, 2009).

Case studies were used in this research in order to gain practical understanding of the process and implementation of EIA in the Iranian water sector. According to Robson (2002) based on the nature of case study research, there are two forms in existence; (1) evaluation where greater flexibility is required to explore all possible lines of investigation and (2) confirmatory where a greater understanding exists and therefore a more fixed design can be adopted. Robson (2002) further highlighted the objectives of a study and emphasized how the strength of theoretical development in the area of interest, will inform how fixed the research design must be. The approach applied in this research was fixed, in order to achieve the aim of the research and to confirm or refute the data collected from interviews with EIA stakeholders (see Chapter 7). These case studies were used to confirm or refute the data collected earlier.

2.3.1 Case selection

As stated earlier, our case study area of the ULB has been undergoing significant changes in terms of lakes drying up. A cursory look at previous studies of ULB reveals the important role of dam building as one of the main drivers of the lake shrinkage and hence, in selecting the case studies within the area, dam projects were considered to explore the role of EIA in dam building. However, only three dams were found to have conducted an EIA study. According to Iranian EIA legislation, 19 dams out of 53 dams in ULB are large dams and need to meet EIA requirement. However, 8 out of 19 large dams have been constructed after the Iranian EIA legislation was promulgated and hence only these eight need to have EIA approval. However, according to EIA Bureau data, out of all the dams in this area, only one has EIA approval. These include Zola, Barandoz and Kani Sib, which are used here as the case studies for exploring EIA effectiveness in this research. The locations of these dams are shown in Figure 2.1.

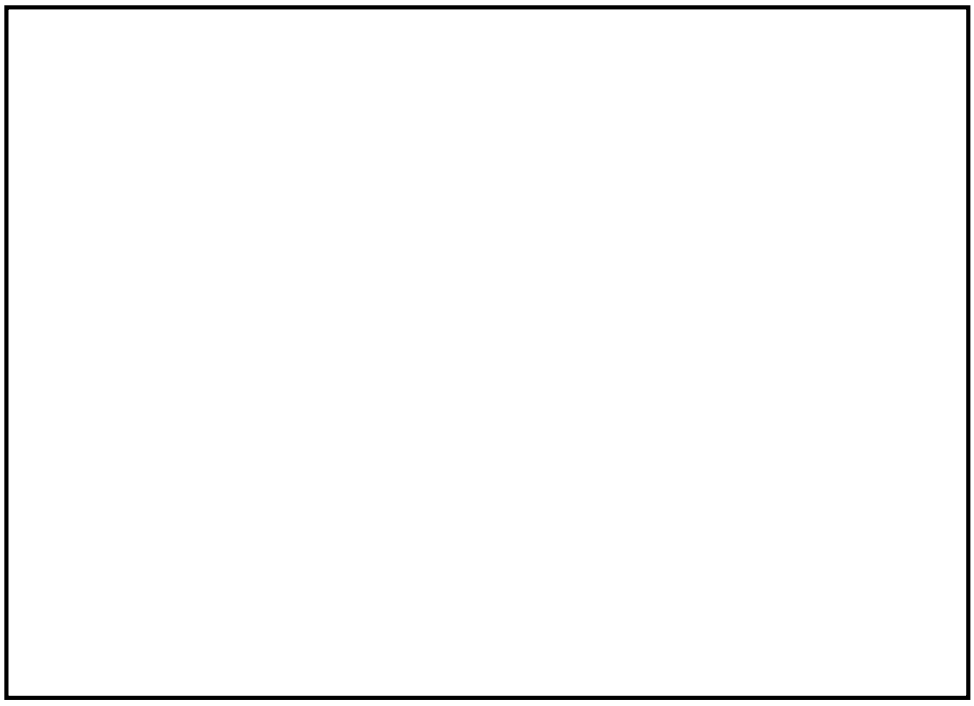

Figure 2.1. Location of the three ULB case studies (Khosravi et al., 2018)

2.4 Methods of data collection

Methods are the techniques used for collecting data for answering research questions or achieving research objectives (Crotty 1998). Case studies are generally multi-method and often rely on interviews, observation and document analysis to obtain rich qualitative data (O'Leary, 2004). This research chooses data collection methods that are usually associated with the qualitative data; semi-structured interviews, document analysis, and site visit observation.

2.4.1 Interviews

Bryman (2012) reports that the interview is a common type of qualitative data collection method due to its flexibility. There are three type of interview that can be identified; Structured, Semi-structured and Unstructured (Table 2.1). The semi-structured interview contains open ended questions that require participants' opinions which help the research work to provide more information on the present situation in the field. The flexibility in conducting semi-structured interviews (Pereira, 2011; Bryman, 2008), with a list of pre-arranged questions that can change and adapt according to interviewees' responses, was a key factor in deciding to use this type of interview

as a data collection technique. Three rounds of interviews were conducted in this research, in October 2017, in May 2018 and in September 2018.

- A total of 30 interviews were conducted at the national level during the first round, which focused on exploring Iran's EIA system (EIA legislation, EIA administration, EIA process) and contextual factors influencing the effectiveness of the EIA system in Iran.
- A total of 20 interviews with local EIA experts in ULB were conducted during the second round of interviews. In these the focus shifted to the provincial level to examine the EIA effectiveness in ULB, and further exploring the contextual factors that had been established in the first round of interviews.
- A total of 10 interviewees were selected from these fifty interviewees (first and second rounds of interviews) on the basis of their seniority, knowledge and experience of the Iran's EIA system and its context to tailor recommendations and tease out their feasibility for the Iranian context. The interviewees represented different stakeholder groups within the EIA system in Iran.

Interviewee background is a significant consideration as EIA actors' perceptions differ due to their experiences with EIA and their specific interests. For example, consultants earning money preparing an EIA study might be more positive about EIA than proponents who are paying for it (Arts et al., 2012). Therefore, respondents were also asked to indicate their role and level of experience in the EIA system.

Table 2.1. Features of the types of interviews

Structured Interview	Semi-structured Interview	Unstructured Interview
The interviewer directs the interview. Pre-arranged questions are set, with no room for deviations. Participant has a limited scope of response	Pre-set topics and questions guide interactions. The interviewer is expected to strike a balance between obtaining the necessary information and collecting information deemed by the interviewee to be of importance	The opinions of the interviewees are paramount in this form of interviews. Participants are encouraged to express themselves on their values, thoughts and attributed meanings. The interviewee controls the mode of interaction
The ordering and language used in asking the question is fixed and standardized for the interviewees	Questions can be asked by the interviewer, a departure from the set questions. The wordings of questions can be adjusted as to make the interviewee understand it better	Structures, procedure or specific questions are of no importance. The interviewee and the interviewer are at liberty to adjust the situation
These are relatively quick and easy to administer	Interview guide are designed to make the process easier to manage	This could consume quite a bit of time and be difficult to manage due to its unscripted nature
Answers can be processed quickly	Data collected are rich and detailed	Data collected would be rich but will also include quite a bit of information that may not required
Not required when insight or depth is required, due to the structured nature of the answers required	Allows the discovery or provides insight into issues important to interviewees not previously identified by the researcher	Considered useful in areas where there is little knowledge about the subject matter or in the investigation of a different perspective on a known topic
Quantitative research	Typically, qualitative research	Useful in grounded theory

Source: (Bryman 2016)

2.4.2 Document analysis

Document analysis is a form of qualitative research in which documents are interpreted by the researcher to gain understanding and develop empirical knowledge around an assessment topic (Bowen, 2009). Document analysis refers to both a data collection method and a mode of analysis ((O'Leary, 2004) and it can be used in many different fields of research, as a primary method of data collection or as a complement to other data collection methods (O'Leary, 2014). The main point is that the 'documents' are pre-produced texts that have not been generated by the researcher and the researcher's role is only gathering, reviewing and interrogating documents (O'Leary, 2004).

Document analysis in this research was used as a compliment to semi-structured interview and site visit to achieve the third objective. Objectives Two and Three of this research focus on the evaluation of EIA effectiveness in the ULB. The evaluation criteria, which underpinned the analysis of

the Iranian EIA system in ULB, were identified through literature review (Table 2.4). As explained earlier, within the ULB only three projects were found to have conducted an EIA and hence had their EIA reports available. These three EIA documents were selected to analyse against these criteria and are listed in Table 2.2.

Table 2.2. Dams reports that are the subject of empirical studies (in Iran)

Project	Scale (height from the foundation)	Status
Barandoz Dam	40 m	In operation
Zola Dam	67 m	Under study
Kani Sib Dam	42 m	In operation

2.4.3 Site visit observation

An evaluative site visit occurs when person with specific expertise and preparation go to a site for a limited period of time and gather information about an evaluation object either through their own experience or through the reported experiences of others in order to prepare testimony addressing the purpose of the site visit (Patton, 2015). In some site visit observation, the researcher gets close to research subjects to understand whether people do what they say they do. In this research site visit was done to complement the document analysis and the second round of interviews to examine the EIA effectiveness of dams' planning against the defined criteria framework in Table 2.3. The site visit was carried out in April 2018 in order to check to which extent some steps of EIA like follow-up were implemented on the ground.

2.4.4 Literature Review

In this research academic literature was used to develop criteria for reviewing the EIA system and criteria framework for examining its effectiveness. It also helped the researcher to frame the research problem at the early stage of this research. Whereas quantitative studies rely on the relevant literature to provide direction for the research questions or hypotheses, qualitative studies typically use the relevant literature to 'frame' the research problem and establish the context (Creswell, 1994; Hammarberg et al., 2016).

2.5 Research Stages

In order to achieve the research objectives, it is necessary to conceive an appropriate research methodology within the research paradigm. This methodology is illustrated in Figure 2.2. Four stages were formulated to explain how this research has been done to review the Iranian EIA system at national level and examine its effectiveness at the ULB as study area in Iran. These four stages of the research have been summarised in Table 2.3 and discussed thereafter.

Table 2.3. Methods used at each stage of the research

Stage	Tasks	Research methods	Objective
Stage 1	1. Review materials on the EIA system and its effectiveness in the world, 2. Develop framework to review the Iranian EIA system, 3. Develop framework to examine the effectiveness of the EIA system in ULB.	Literature review	Objective 1 Objective 2
Stage 2	Review the EIA system in Iran based on adapted criteria	Literature review Document Analysis Semi-structured interview	Objective 1
Stage 3	1. Analyse three EIA reports of dams in ULB based on defined criteria, 2. Conduct semi-structured interviews to complement the data (answer the remaining criteria not answered in the EIA report analysis), 3. Review water management plan in ULB (the Urmia Lake restoration plan).	Semi-structured interviews Document analysis Site visit	Objective 3
Stage 4	Provide recommendations to increase EIA effectiveness in Iran's Water Management system.	Semi-structured interview	Objective 5

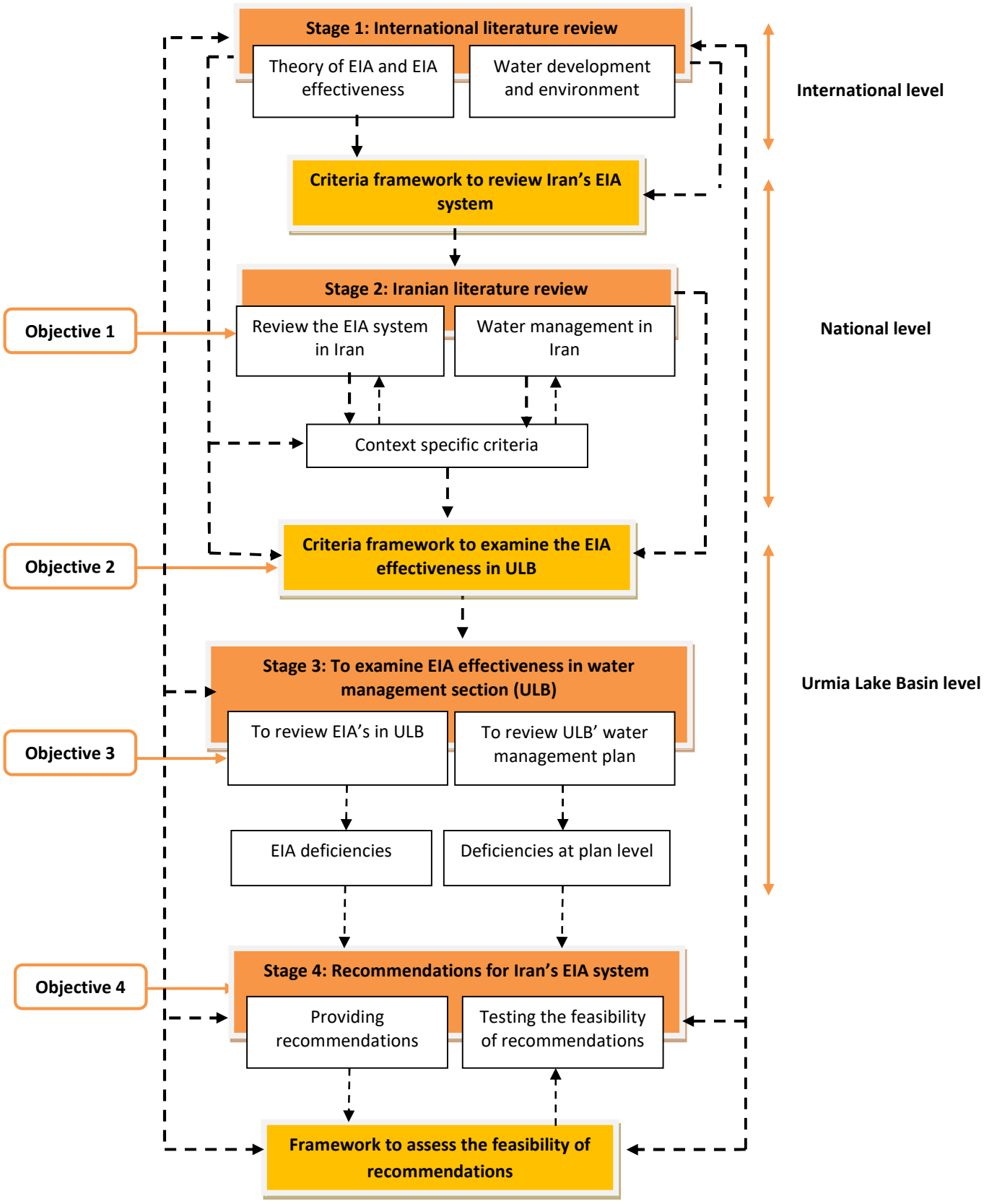

Figure 2.2. Four stage research methodology

2.5.1 Stage 1

Marczyk et al. (2005, p. 33) claim "*the primary purpose of a literature review is to help researchers become familiar with the work that has already been conducted in their selected topic areas*." There is already a body of literature on EIA systems and effectiveness, so a literature review at this early stage is mainly aimed at comprehending relevant literature and properly framing the research problem. However, more importantly, literature review at this stage has been used to develop the criteria framework for this research. This has been achieved in Chapter 3 which sets the theoretical perspective of EIA and its effectiveness, the framework to review the Iranian EIA system (see Section 2.5.2.1) and the framework to examine EIA effectiveness in ULB (see Section 2.5.3.1). Two sub-questions are addressed in this step:

1. What are the criteria to review Iran's EIA system?
2. What are EIA effectiveness criteria to examine EIA effectiveness in the ULB?

2.5.2 Stage 2

The aim of the second stage is to fulfil the first research objective; "*To review the status of the Iranian EIA system and identify its strengths and its deficiencies".* This stage investigates the EIA system components such as legislation, administration and process; rather than outcomes and actual environmental performance. As a result, this step concentrates on the current status of the EIA system in Iran, and two sub-questions are addressed:

1. What is the status of Iran's EIA system in terms of EIA legislation, administration and process?
2. What are the strengths and deficiencies of the EIA system in Iran?

This has been conducted using a framework, which has been developed based on reflecting international experiences and presented in next section.

2.5.2.1 Framework to review the Iranian EIA system

To review the Iran's EIA system, different sets of criteria were reviewed in section 3.1.8. The evaluation criteria used in this section are adapted from Naeem and Hameed's review of the EIA

system in Pakistan (2008) (See section 3.1.8, Table 3.4) and are presented in Table 2.4. Nadeem and Hameed's work was found to be especially suited to the Iranian context as it similarly encountered a lack of literature and precedent for conducting EIA reviews (Khosravi et al., 2019a). Like Pakistan, Iran's EIA system has not yet been reviewed, and the new set of criteria consisting of stages of EIA process, legislative provisions, and institutional setup for EIA helped in providing a comprehensive evaluation framework. Nevertheless, as it has been explained in section 3.1.7, EIA is contextual, and criteria need to be tailored to the idiosyncrasies of the country in which it is applied (Bond and Pope, 2012; Morgan, 2012). Accordingly, some sub-criteria were modified to suit the Iranian context. For example, the legal basis in Iran is not an EIA-specific law, so questions about sufficiency of the existing law and implications of proceeding without EIA approval were considered to be important sub-criteria. These sub-criteria then were translated to questions form and presented as the interview questions.

Table 2.4. List of evaluation criteria and sub criteria used to review the EIA system of Iran

Criteria	Sub-criteria	Source of data		
		Literature review	Interview	Document analysis
Legislative provisions for EIA	EIA- specific law	✓	✓	✓
	Adequacy of the law for conducting an EIA	✓	✓	
	The EIA process steps in regulations		✓	
	Implications of proceeding without EIA approval		✓	
Administrative set up for EIA	Competent authority for EIA	✓	✓	✓
	EIA review body		✓	
	EIA centralisation at the national level		✓	
EIA process	Screening	✓	✓	✓
	Scoping	✓	✓	
	Consideration of alternatives	✓	✓	
	Public participation	✓	✓	
	EIA reviewing		✓	
	EIA Follow-up		✓	

Source: Adapted from Nadeem and Hameed, 2008; ✓ Information available

2.5.2.2 Detailed methodology of stage 2

To evaluate the EIA system in Iran against the evaluation criteria, this stage starts with a review of literature discussing the Iranian EIA system. This effort has been further complemented with document review and semi-structured interviews due to the dearth of literature available on the Iranian EIA system (Khosravi et al., 2019a). Some translation from Persian into English has also been required. This combination of methods also allows the research to achieve some degree of triangulation (Benson, 2005) by combining several pieces of evidence gathered from different methods and techniques (Pereira, 2011). Semi structured interviews are therefore conducted to clarify how the EIA is currently being applied in Iran, and involves examination of three main themes, EIA legislative requirements, EIA process and EIA administration. A list of interview questions to be covered in the interview is presented in table 2.5. These are a question form of criteria which were discussed in previous section (See also Chapter 3, section 3.1.8)

Table 2.5. Interview questions for reviewing the Iranian EIA system

Purpose	Sub criteria in the form of questions
Reviewing EIA legislation	Is there EIA- specific law or is EIA a part of another law?
	Do you think it is sufficient for conducting EIA?
	Are steps of the EIA process specified in regulations as mandatory steps?
	If proponents go ahead with their projects without EIA approval, would there usually be a judicial review (Is there any penalty in the event of a violation of the law)?
Reviewing EIA process	What kinds of projects are required to do EIA? How is the screening decided in Iran?
	How is the scoping step conducted in Iran?
	Are environmental impacts of alternatives considered in the EIA process?
	How is public participation considered during the EIA process?
	Are mitigation measures implemented?
	Is monitoring implemented in Iran?
	Does inspection happen in Iran?
Reviewing EIA administration	Who is responsible for making regulations and providing guidance for EIA?
	Who is responsible for reviewing EIA reports?
	Who is responsible for inspecting EIA implementations?
	Is EIA centralised at the national level in Iran?

Source: Adapted from Nadeem and Hameed (2008)

The interviews were undertaken with EIA actors who were directly involved in the EIA system in Iran, particularly the Iranian DoE as the Iranian DoE is responsible for the activities related to protection of the environment at the national level. Thirty interviews were completed with Iranian EIA actors from various organisations, as shown in Table 2.6. The interviewees were selected based on their role and expertise and include members from the EIA Bureau who review EIA reports, as well as proponents, consultancies, universities and NGOs.

Table 2.6. First interview participants

Organisation	Section	Number
DoE	EIA Bureau	10
Developers	Water resources management company, and other organisations	5
Consultancies	EIA sections	8
NGOs	-	4
University	University of the Environment	3
	Total	**30**

2.5.3 Stage 3

This stage examines the effectiveness of EIA within the ULB case study area against the framework (see Section 2.5.3.1). In order to examine the effectiveness of the EIA (the third research objective), three EIA reports of dams undertaken in ULB are reviewed and complemented with semi-structured interviews and site visits. This step addresses two sub-questions of the research:

1. What is the current status of EIA studies in ULB?
2. To what extent is EIA effective in water developments in ULB?

Next section explains the framework which has been developed and used to examine the EIA effectiveness in the ULB.

2.5.3.1 Framework to examine the EIA effectiveness in ULB

The aim of this section is to develop a framework to examine the EIA effectiveness in ULB. The framework is constructed using EIA effectiveness theory, EIA effectiveness criteria in international practice from Chapter 3, and the Iranian EIA context which is established from the findings of the first round of interviews (previous stage). As EIA effectiveness is context-specific, evaluation of its effectiveness is only meaningful when the contexts of the country are taken into consideration (Bond and Pope 2012; Zvijáková et al., 2014; Khosravi et al., 2018). Therefore, the Iranian context were considered, and further criteria were added to the framework based on the result of the previous stage. The evaluation criteria which underpinned the analysis of this section, are listed in Table 2.7. Discussion in Chapter 3 shows that two categories apply to EIA effectiveness criteria; procedural, and substantive effectiveness. Each of these criteria were translated into questions to provide a comprehensive framework for analysing EIA effectiveness. The criteria framework was designed to focus on the EIA effectiveness, rather than the quality of the EIA process.

Table 2.7. List of criteria used in examining the EIA effectiveness in ULB

EIA Effectiveness	Criteria	Question form of criterion	Source of data		
			Interview	Document analysis	Site visit
Procedural effectiveness criteria	P1. Scoping	Does EIA consider early participation of stakeholders in the scoping?	✓	✓	
	P2. Cumulative effects	Does EIA consider cumulative impacts of other dams in the basin?	✓	✓	
	P3. Alternatives	Does EIA consider Alternatives of a dam?	✓	✓	
	P4. Participation	Do Stakeholders participate during dam's EIA process?	✓	✓	
	P5. EIA Follow- up implementation	Are the EIA's conditions implemented? Does the EIA consider the Environmental water right of river? Is monitoring implemented in water management?	✓	✓	✓
Substantive effectiveness criteria	S1. Decision-making	Does EIA integrate with decision-making and affect project design?	✓		
	S2. Communication	Is there regular communication between EIA and design team?	✓		
Contextual factors	C1. EIA Legal basis	Is there a clear legal for conducting EIA?	✓	✓	
	C2. Culture of decision-making	Does having centralised governments affect effectiveness of EIA?	✓		
	C3. Political pressure	Does the political will have affect in EIA approval?	✓		
	C4. Human, and Organisational Capacity	Is there adequate skilled staff for the EIA administration? Do EIA actors have open attitude towards change?	✓	✓	
	C5. Changing party politics	Does changing government affect the EIA system?	✓		

✓ Information available

2.5.3.2 Detailed methodology of stage 3

Data collection in this stage is conducted by document analysis (the EIA reports), semi-structured interviews and site visits. The EIA reports do not cover all EIA effectiveness criteria of an EIA, in these cases, interviews and site visits will complement EIA system analysis to cover all questions of criteria framework. This round of interviews was carried out to examine the EIA effectiveness of dams' planning against the defined criteria framework in Table 2.7.

Questions were designed on the basis of the EIA effectiveness criteria framework (Table 2.7). Criteria P1 to P5 of Table 2.7 has been developed based on Van Doren et al., 2013, Arts et al., 2012, Hapuarachchi et al., 2016, Chanchitpricha and Bond, 2013, Arend et al., 2009, and Polido et al., 2016. Criteria S1 to S2 have been developed based on Arts et al., 2012, Theophilou et al., 2010. Gallardo and Bond 2011. Criteria C1 to C5 are based on contextual factors that were identified by means of the first round of interviews and are discussed in Chapter 6. These contextual factors were explored in further detail in the 20 interviews that were carried out with local EIA experts. The analysis of contextual factors ensures the EIA researcher has realistic expectations with regard to EIA effectiveness (Hilding-Rydevik and Bjarnadóttir, 2007; Runhaar and Driessen, 2007; van Doren, 2013).

Twenty interviewees were selected using snowball sampling, commencing with referrals from known contacts in the Iranian EIA community and water authorities (Table 2.8). The Iranian Ministry of Energy (MoE) is the main organisation involved in water development at the national level, and they manage water resources and make decisions about the construction of water infrastructure. Provincial Water Companies are the executive arm of the MoE. The ULB is located in West- and East Azarbayjan Provinces, therefore, interviewees were chosen from local experts of these provinces. Thus, during this round of interviews, the focus shifted to the provincial level. It should be noted that it was not possible to interview the people who had been directly involved with the three EIAs. However, interviewees included EIA consultancies who were involved in EIA of other dams in the ULB.

Table 2.8. Participants in the second set of interviews

Provinces	Organisation	Number
West- Azarbayjan Province	DoE in West- Azarbayjan	3
	West- Azarbayjan Water Company	4
East- Azarbayjan Province	DoE in East- Azarbayjan	3
	East- Azarbayjan Water Company	4
-	EIA consultants	6
	Total	**20**

Due to the deteriorating condition of Urmia Lake, the Iranian government announced a national plan called the "Urmia Lake Restoration Plan" (ULRP) in July 2013 (ULRP, 2016b; Shadkam, 2017). This plan was also reviewed in this stage to investigate environmental consideration at the planning level in ULB.

2.5.4 Stage 4

The main purpose of this stage is to synthesise the key issues from stages 1 to 3, so as to develop recommendations for EIA to support effective incorporation of environmental considerations within decision-making in the Iranian EIA system. Then the feasibility of recommendations is tested based on the following framework and Iran's contextual factors. This step addresses the following sub-questions of the research:

1. What should be done to improve EIA effectiveness in Iran and the water management sector?

2.5.4.1 Framework to assess the feasibility of recommendations

Most of the recommendations provided by researchers are transplanted from Western democratic countries to developing countries without assessment of the feasibility of such recommendations in the light of context (Kolhoff et al., 2009). To overcome this deficiency a framework analysis was provided to examine the feasibly of our provided recommendations.

This section started with shortlisting countries which are developing in nature and have reviewed their EIA systems to propose recommendations for improvement. Based on this criteria, 11 countries were shortlisted and reviewed (See Table 2.9). The review reflected that the typical recommendations can be broadly categorised under four headings which include a) EIA regulations, b) public participation, c) capacity building and d) follow-up. Based on the findings, the framework analysis of this section was developed. These four typical recommendations were asked during interviews to test the feasibility of them based on Iran's context.

Table 2.9. Typical recommendations to improve EIA system in developing countries

Authors	EIA system	Recommendations			
		Strengthening EIA legislation	Improving public participation	Increasing capacity building	Improving EIA follow-up
Annandale (2001)	Maldives		*	*	
Ahmad and Wood (2002)	Egypt, Turkey and Tunisia		*	*	*
El-Fadl and El Fadel (2004)	The Middle East and North Africa region		*		*
Nadeem and Hameed (2008)	Pakistan		*	*	*
Badr (2009)	Egypt			*	*
Marara et al (2011)	Kenya, Tanzania and Rwanda	*	*	*	
Panigrahi and Amirapu (2012)	India		*	*	*
Wayakone, and Makoto (2012)	Lao PDR	*	*	*	*
Al-Azri et al (2014)	Gulf Cooperation Council States	*	*		*
Ahmad and Ferdausi (2016)	Bangladesh	*		*	*
Aung (2017)	Myanmar		*	*	

2.5.4.2 Detail methodology of Stage 4

Based on the framework, the following four questions were asked during interviews to test the feasibility of the main recommendations in Iran's context that was identified during last stages.

1. Would it be possible to enhance EIA regulation in Iran?
2. How could public participation be initiated in Iran?
3. Would capacity building be necessary to improve Iran's EIA system?
4. How could EIA follow- up work in Iran?

In first and second rounds of interviews, fifty Iranian EIA actors were interviewed several times. Ten were selected from previous rounds of interviews on the basis of their knowledge and experience of Iran's EIA system and its context. These ten then participated in a form of interview and were asked the feasibility of the recommendations.

2.6 Data Analysis

Data collected from the interviews in this research were analysed using a thematic analysis approach. Thematic analysis as an independent qualitative descriptive approach is mainly described as "a method for identifying, analysing and reporting patterns (themes) within data" (Braun & Clarke,2006: 79). Thematic analysis is a form of content analysis. Content analysis is a research method that evaluates the degree of attention to certain themes, codes or issues (Neuman, 1997, Ahammed and Nixon, 2006). According to Bryman (2008, p. 275), "*Content analysis is an approach to the analysis of documents and texts that seeks to quantify content in terms of predetermined categories and in a systematic and replicable manner*".

In this research, the data was collected during the interviews in the form of audio recordings. The interviews were conducted in Iran and transcribed in Persian, and only the parts used as quotations were translated into English. These interviews were then transcribed and then coded manually. Thematic coding is a process where the transcribed data is broken down into component parts and then ascribing meaning to those parts (Bryman, 2012). These codes can be words, fragments of sentences, whole sentences or even whole paragraphs (Rozema, 2014). These codes are then categorised and labelled with a term. Categories are therefore composed of several sets of codes and they can be linked to the dominant themes in the research (Rozema, 2014). This approach enables the researcher to realise the participants' perspective based on the way they have responded across the various identified themes (Bryman, 2012).

2.7 Ethical considerations in the research

According to Neuman (2007: 48) 'ethics helps to define what is, or is not, legitimate to do or what moral research procedures involve'. Data collection in this research started with following the ethical procedure of the University of Liverpool and formal ethical approval was received from the University of Liverpool's ethics committee. The committee reviewed all interview guidelines and structures, to ensure it met the highest ethical standard available.

Research participants were initially contacted by email and telephone. The researcher introduced herself, briefly outlined the research and emphasised that their participation in the interviews would be very beneficial for this study. All interviews are conducted in professional or business locations. At the start of the interviews, research participants were given the Participant Information Sheet (see Appendix B) which informed them of the research details and the requirements of their participation. At this stage, participants were also asked to sign a Consent Form (see Appendix C). The information sheet and consent align with the principle of obtaining freely informed consent, which will guide prospects in their decision either to participate or not (Bryman, 2012). Therefore, in the information sheet it was explained that the participation of the interviewee is voluntary, and they are free to withdraw at any time without giving any reason. This also comprised a confidentially agreement between researcher and interviewee and allowed the researcher to record the interviews and use the information gathered only for academic purposes without citing names and specific positions. Confidentiality and anonymity of respondents were strictly enforced, guaranteeing participants could talk freely with no fear of reprimand. The researcher ensured information collected from the respondents were anonymized during the write up. Coding was adopted to protect the identities of respondents, this was done to ensure the safety of respondents before, during and after the research.

2.8 Chapter summary

This chapter has provided the overall research strategy and methodology adopted for this study in order to address the research aim and objectives. The research methodology adopted is qualitative

in nature and includes the following methods: Semi-structured interviews, Document analysis, and Site visit observation. Literature review has been used in developing the criteria framework. Three field trips have been conducted to collect data for this research.

This chapter explained how each objective is achieved through use of these methods. As this research aimed to review the EIA system in the Iranian planning context and to examine the EIA effectiveness in the water management, the literature review provides a background for the research. So as to review the Iranian EIA system, semi-structured interviews were selected as a main method to gain a detailed understanding of the role of the EIA in the planning process based on interviewees' perceptions. To examine EIA effectiveness in the water management sector, the combination of semi-structured interviews, document analysis, and site visit allowed the researcher to achieve a collection of rich data. To test the possibility of recommendations based on Iran's' context, a third round of interview was done. Finally, a thematic analysis method was used to analyse the data that had been collected.

3 EIA and its Effectiveness: Theoretical perspectives

This chapter provides a theoretical foundation for the research and it consists of three sections. The first section looks at EIA theoretical perspectives, starting with a brief introduction to EIA, its definitions, system components and national EIA system criteria. The second section looks at EIA effectiveness, presenting various definitions, and explaining EIA effectiveness categorisations, various EIA effectiveness criteria and the role of contextual factors in the EIA effectiveness. The last section provides a summary of the chapter.

3.1 EIA theoretical perspectives

3.1.1 EIA definitions

According to the International Association for Impact Assessment (IAIA), EIA is defined as "*a process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made*" (IAIA, 2009; Marara et al., 2012, p.286). Wood (2003) defines EIA as an "*evaluation of the impact which is likely to arise from a project significantly affecting the natural and man-made environment*." This definition extends the evaluation of the impact to the man-made environment. Canter (1996) defines EIA more broadly by including the impacts of plans, programmes and legislative actions. Canter regards EIA as a systematic identification and evaluation of the potential impacts of proposed projects, plans, programmes or legislative actions; relative to the physical-chemical, biological, cultural and socio-economic components of the total environment. What is new in Canter's definition is bringing Strategic Environmental Assessment (SEA) into the scope of the EIA (Wood, 2003). At the level of policies, plans and programmes, Environmental Assessments are referred to as SEA; whilst at project level they are referred to as EIA (Fischer, 2005). Importantly, SEA provides decision-makers with an evaluation of alternatives to avoid, mitigate, or compensate negative impacts (Fischer 2003; Zhu & Ru 2008).

3.1.2 EIA background

EIA was introduced more than forty years ago in the form of the US National Environmental Policy Act (NEPA) and has since spread around the world to nearly all countries (Bond et al., 2017; Morrison-Saunders and Retief, 2012; Morgan, 2012). Of the 193-member nations of the United Nations, 191 either have national legislation or have signed some form of international legal instrument that refers to the use of EIA (Morrison-Saunders and Retief, 2012). In Europe, the adoption of European Union EIA Directive in 1985 motivated the enactment of EIA legislation in several European countries in the late 1980s (Benson, 2003; Rantlo, 2015).

Although EIA procedures are similar worldwide, the quality of EIA system varies from country to country (Suwanteep et al., 2016). There is a clear difference between EIA systems in developed and developing countries (Wood, 2003). The evolution of EIA systems in developing countries differs from that of developed countries (Wood, 2003; Momtaz and Salim, 2013). EIA was introduced in developed country mostly in response to the national demand for better environmental protection (Wood, 2003; Momtaz and Salim, 2013), whereas the evolution of EIA systems in developing countries have frequently been in reaction to natural calamities (Jha-Thakur, 2006; Khosravi et al., 2019a) and requirements of funding institutions such as the World Bank (Munyazikwiye, 2011). Compared to many jurisdictions in the developing world, Southeast Asia and Latin America, countries in the Middle East and North African region were relatively late in introducing EIA systems (Ahmad and Wood, 2002). EIA was first introduced in the Middle East in 1982 in Oman (Moradi, 2009), followed by Turkey, Tunisia and Egypt in the 1990s (Ahmad and Wood, 2002; George, 2000; Moradi, 2009). Most other countries in the Middle East introduced EIA in the 1990s (Moradi, 2009). EIA in Iran was first introduced in 1994 by the 2nd National Development plan (NDP) (Khosravi and Jha-Thakur, 2018; Khosravi et al., 2018; Khosravi et al., 2019a; Khosravi et al., 2019b).

3.1.3 EIA system components

Since the main aim of this research is to evaluate effectiveness of EIA at system or macro level, it is necessary to understand the elements of an EIA system. Discussion about EIA effectiveness has

covered a range of issues including assessment of the EIA at system and project levels (Cashmore et al., 2009; Zvijáková et al., 2014). EIA effectiveness criteria vary according to these levels. At a project level, EIA is evaluated in practice and effectiveness depends on the actors involved, their interests and power positions (Fischer and Gazzola, 2006; Hilding-Rydevik and Bjarnadóttir, 2007; Kørnøv and Thissen, 2000; Runhaar and Driessen, 2007; Arts et al., 2012). At the system level, EIA effectiveness depends on characteristics of EIA legislation, such as the presence of "follow-up" requirements (Arts et al., 2012; Sadler, 2004; Wood, 2003). Marara et al. (2011) identified the framework of legal, administrative and procedural as the three key elements of EIA system in their research. Suwanteep et al. (2016) introduced the EIA system components of regulation, authority involved with EIA, and EIA processes. The EIA system components that are common to the different researchers are EIA legislation, EIA administration and EIA Process (Khosravi et al., 2019a). The following section discusses the main EIA system components.

3.1.4 The EIA legislation component

Partidario (2000) argues that a clear legal framework is helpful to ensure EA arrangements and procedures are consistently operated in a clear way. EIA legislation includes the statutory principles of EIA, which are necessary for managing the EIA process effectively (Momtaz and Salim, 2013). At a minimum, EIA legislation, together with any supplementary regulation, should specify the following (Sadler, 1996; Abaza et al., 2004):

- Area and aspects to be covered, and the proposed actions and impacts to be assessed.
- Procedures for administering and applying the EIA process.
- Responsibilities and duties of proponents, competent authorities and decision-making bodies.
- Relationship to decision-making and how the EIA process should be used in the approval of proposed actions.
- Compliance and enforcement measures to be taken when correct procedures are not followed.

Although strong legislation has been said to be a prerequisite for an effective EIA system (Sandham et al. 2013), simply defining EIA in legislation does not ensure success in EIA practice (Morrison-Saunders and Retief 2012). Sometimes legislation alone can also be detrimental to EIA because of a lack of knowledge, clarity and enforcement (Fischer and Jones 2016). In some cases, EIA requirements are present but there are some underlying barriers to conducting the EIA. For example, whilst Pakistan has a sound legal basis and comprehensive guidelines, its EIA has not yet evolved satisfactorily (Nadeem and Hameed 2008; 2018). India is another example of a democratic country with quite comprehensive EIA legislative provisions that include explicit state penalties, fines and imprisonment for EIA violations. Still, the lack of implementation requirements and lack of enforcement mechanisms has turned EIA almost into a formality (Panigrahi and Amirapu 2012; Jha-Thakur 2011).

3.1.5 The EIA administration component

This component comprises core structural elements that identify who may be responsible for the EIA process, and their roles and responsibilities (Hegazy, 2013). Generally, the EIA system involves public and donor agencies, consultants, review agencies, NGOs, media and judicial agencies (Momtaz and Salim; 2013). According to Partidario (2000) and Hegazy (2013), it is crucial to clearly identify those involved in EIA and allocate responsibility for each actor in processes such as conducting, reviewing and inspecting EIA.

3.1.6 The EIA process component

EIA systems vary between countries but the processes they follow tend to be similar (Kolhoff, 2009). An EIA process contains screening, scoping, impact analysis, mitigation and impact management plan, EIA report, review, decision-making, implementation and follow-up (Hasan et al. 2018). Though public participation can take place at any stage during an EIA, it must be incorporated as well as its results need to be reflected while studying the scoping, impact analysis, mitigation and impact management plan, EIA report, review components of an EIA (ELAW, 2015; Ogola, 2007; UNEP, 2015).The EIA process involves a series of steps with feedback and interaction, as shown in Figure

3.1 (Glasson et al., 2012; Cameron, 2003) and explained in the sections that follow. Most of these steps occur within pre-decision stages, reflecting a primary emphasis on predicting impact and introducing mitigation measures, rather than their subsequent cure (Dipper et al., 1998, Glasson et al., 2012).

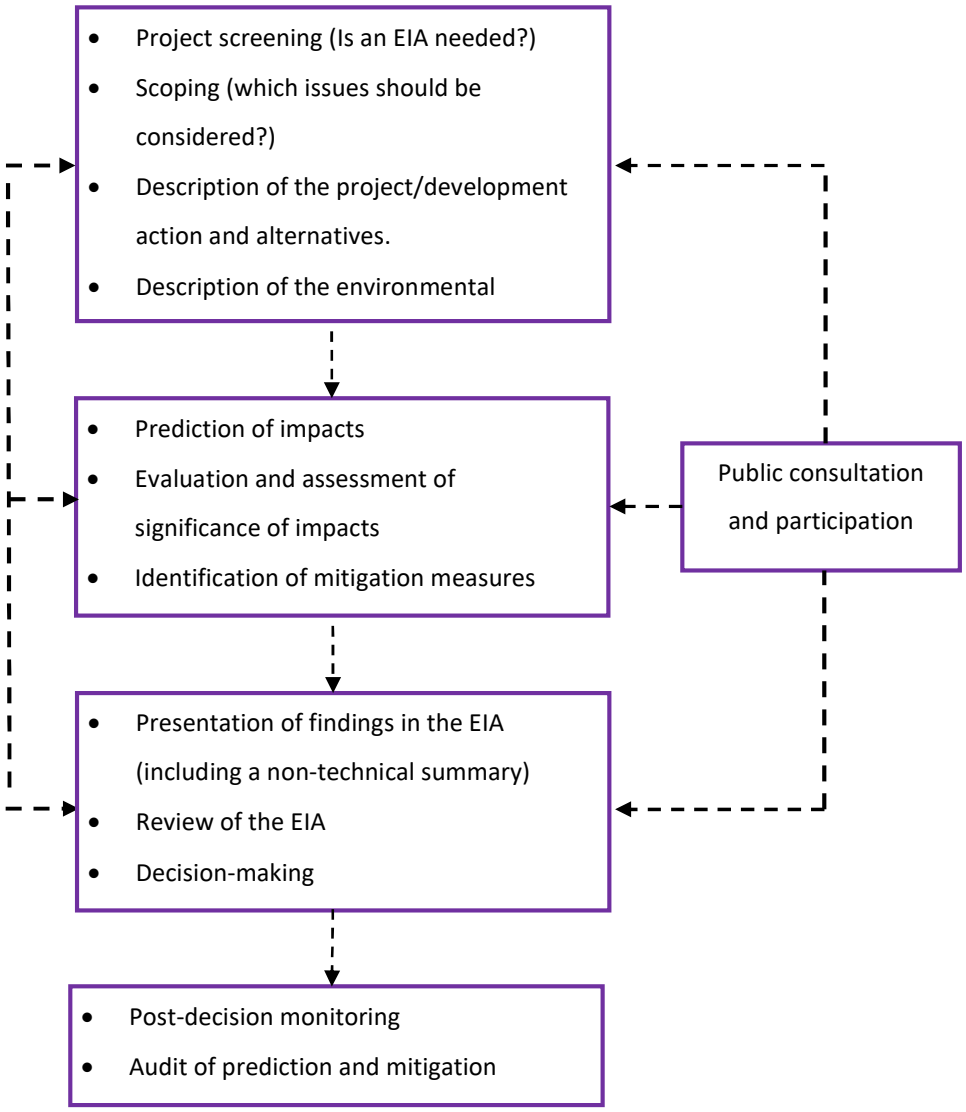

Figure 3.1. General steps in the EIA process

Source: Glasson et al., 2012

3.1.6.1 Screening

Screening determines whether a project should be subject to a formal EIA based on its potential to cause significant impacts (Rajaram and Das, 2011). It focuses on those projects with potentially significant adverse environmental impacts, or whose impacts are not fully known (Glasson et al., 2005). Screening can be partly determined by the EIA regulations operating in a country at the time of an assessment (Glasson et al., 2005). Glasson et al. (2005) and Rajaram and Das (2011) have outlined the following two approaches to EIA screening:

- **Threshold approach:** This adheres to the concept of a development centered approach and it is set in terms of size or capacity of projects.
- **Case-by-case screening approach**: It is environment centered approach, where every proposal is scrutinised for its impact on a specific environment like sensitive areas, regardless of the size or capacity of the project.

According to Rajaram and Das (2011), an effective screening approach has to be a hybrid of threshold and case-by-case approaches.

3.1.6.2 Scoping

The scoping step identifies the significant issues, determining those that need to be addressed in the EIA (Snell and Cowell, 2006). Fischer and Phylip-Jones (2008) state the purpose of scoping is:

- To identify the important issues to be considered in an EIA, including the baseline and alternatives.
- To determine the appropriate space and time boundaries for the EIA.
- To establish the information necessary for decision-making.
- To anticipate the significant effects and factors to be studied in detail.

Scoping has been identified as a common weakness in many countries' EIA processes (Abaza et al., 2004). Some jurisdictions have moved to using generic terms of reference (TOR) for EIA reports.

EIANZ (2013) mentioned that tighter scoping of EIAs would benefit proponents in terms of cost and time requirements, also reduce the burden on regulators and EIA reviewers.

3.1.6.3 Consideration of alternatives

Consideration of alternatives lies at the heart of EIA (Glasson et al., 2012: Khosravi et al., 2019a). This step aims to ensure that the proponent has considered other feasible approaches, including alternative project locations, scales, processes, layouts, operating conditions and the "*no action*" option (Glasson et al., 2012). It also provides a framework for the competent authority's decision, rather than merely a justification for a particular action (Glasson et al., 2012). Despite of the importance of this step, it is inadequately carried out in many countries (Kamijo and Huang, 2016; Khosravi et al., 2019a). In some countries such as the Netherlands, there is a formal requirement to assess alternatives in the EIA (Arts et al., 2012).

3.1.6.4 Impact prediction, evaluation and mitigation

The stages of impact prediction, impact evaluation and impact mitigation represent the 'technical core' of the EIA process (Rozema, 2014). Impact prediction is a pre-decision stage where the impacts of a project are predicted based on speculation, professional judgement, experience from other studies, experimental evidence, and statistical modelling (Beanlands and Duinker, 1984; Glasson et al., 2012). Impact evaluation is the stage where the significance of the predicted impacts is determined (Glasson et al., 2012; Rozema, 2014). Impact mitigation involves identifying measures to avoid, reduce, remedy or compensate for any significant adverse impacts (Glasson et al., 2012; Rozema, 2014).

3.1.6.5 Public participation

Public participation aims to ensure the quality, comprehensiveness and effectiveness of the EIA; and that the public views are adequately taken into consideration in the decision-making process. The importance of strengthening public participation within EIA has been highlighted by several authors (Glasson, 1999; Jarvis and Younger, 2000; Jha-Thakur and Fischer, 2016). Public participation in the EIA process can commence from early participation (such as the scoping stage) to late participation

(such as the reviewing stage) (Chen, 2013). Bond et al. (2004) concentrated on early public participation and claim that this must take place early in the decision-making process and ideally within the screening and scoping stages. Yang (2008) and Glucker (2012) also claim that the late involvement of the public is a barrier to effective public participation in EIA (Chen, 2013). Countries with a good record of public participation are the Netherlands and Denmark, which may be due to early public involvement (Glasson et al., 2005; Wood, 2003; Nadeem and Fischer, 2011).

Legality of public participation in EIA can be seen an important indicator, and not all EIA legislation requires public participation (Chen, 2013). However, experience suggests that many countries with developing EIA practice need a legally required public participation process (Steinhauer, 2012).

3.1.6.6 Review of EIA reports and decision-making

Reviewing EIA reports is another step in the EIA process, and its aim is to ensure the quality of previous stages (Glasson et al., 2012). This may involve reviewing stage controls to check whether the EIA report contains the information necessary for decision-making on the specific project. In the EU, guidance checklists are available to assist reviewers (European Commission, 2013; Rozema, 2014). Decision-making determines whether a proposal is acceptable and complies with public policies, plans and programs. In this stage the DoE decides either to authorise or refuse the planning approval (Rozema, 2014).

3.1.6.7 EIA Follow- up (Ex post evaluation)

While ex-ante evaluation is predictive in nature and is usually associated with the pre-decision stage, ex-post evaluation provides for feedback into the pre-decision stage. Recently the term ex-post evaluation has synonymously been used as ‘follow-up’ (Jha-Thakur et al. 2009). Follow-up is used as an ‘umbrella term’, encompassing various activities that may include monitoring, auditing, ex-post evaluation, post-decision analysis and post-decision management (Arts et al., 2001; Jha-Thakur et al. 2009). Auditing is a part of follow-up (Jones and Fischer, 2016).

However, to date, follow-up research has often focused on monitoring, which is the key to implementation of other follow-up components such as auditing (see Telfer et al., 2009; Partidário and Fischer, 2004; Morrison-Saunders and Bailey, 1999). An effective EIA system is characterised by the proper implementation of mitigation measures along with follow-up. These post-EIA activities are an integral part of an effective EIA system (Momtaz and Kabir; 2013). Mitigation measures recommended by the EIA report need to be adequately implemented by the proponents, and sufficient funds for the implementation of mitigation measures must be provided.

3.1.7 Criteria to review EIA systems

Existing frameworks to review EIA systems and their criteria were studied in order to evaluate the Iranian EIA system, and these are listed in Table 3.1. In most of these studies, researchers were particularly interested in EIA systems in developing countries (Zeremarian and Quinn, 2007; Aung, 2017), and within that context these can be broadly grouped into criteria proposed by Wood (1995), and criteria proposed by Ahmad and Wood (2002). Choice of the criteria will depend on the authors' purpose (Momtaz and Kabir, 2013).

Wood (1995) developed a set of 14 criteria to assess EIA systems within an international context, revolving around EIA legislation, administration, process and measures for improvement (Aung, 2017; Badr, 2009). Annandale (2001) modified Wood's criteria and included local organisational, jurisdictional and cultural issues of small developing countries such as the Maldives (Annandale, 2001; Ahmad and Ferdausi, 2016; Aung 2017). Wood's 14 criteria were regrouped into seven categories: Legal/administrative backing, Preliminary Assessment, Detailed Assessment, EIA study review, Decision-making, Follow-up, and Administrative support (Ahmad and Ferdausi, 2016; Aung 2017). Annandale's revised criteria were utilised by Ahmad and Ferdausi (2016) and Aung (2017) to evaluate the EIA system in Bangladesh and Myanmar, respectively.

Ahmad and Wood (2002) developed a set of criteria to compare the EIA systems of Egypt, Turkey and Tunisia. These evaluation criteria are set out in Table 3.2, and divided into the following two categories as per Badr (2009):

- **Systemic criteria**; based on the EIA legislation, EIA administration, and EIA process.
- **Foundation criteria**; defined as actions undertaken to improve effectiveness of the EIA system.

Table 3.1. Different EIA criteria in reviewing EIA systems

Authors	Criteria	EIA system	Method
Wood (1995)	Wood criteria (1995)	International context	Literature review
Annandle (2001)	Modified Wood (1995) criteria	Maldives	Literature review
Ahmad and Wood (2002)	Ahmad and Wood (2002)	Egypt, Turkey and Tunisia	Interview
El-Fadl and El Fadel (2004)	Ahmad and Wood (2002)	Middle East and North Africa region	Literature review
Nadeem and Hameed (2008)	Adapted from Wood (2003); Ahmad and Wood (2002); Fuller (1999).	Pakistan	Literature review and interview
Badr (2009)	Ahmad and Wood (2002)	Egypt	Interview
Panigrahi and Amirapu (2012)	Ahmad and Wood (2002) adopted	India	Literature review, Analysis of various legal provisions and interview
Wayakone, and Makoto (2012)	Adapted from Wood (1995).	Lao PDR	Literature review
Al-Azri et al. (2014)	Ahmad and Wood (2002)	Gulf Cooperation Council States	Literature review
Ahmad and Ferdausi (2016)	Annandale's modified Wood criteria	Bangladesh	Literature review
Aung (2017)	Annandale's modified Wood criteria	Myanmar	Literature review, Semi structure interview

Source: Khosravi et al., 2019a

Table 3.2. EIA evaluation criteria by Ahmad and Woods, 2002

Category	Criterion
Systemic criteria	**EIA legislation** 1.1 Legal provisions for EIA 1.2 Provisions for appeal by the developer or the public against decisions 1.3 Legal or procedural specification of time limits 1.4 Formal provisions for SEA
	EIA administration 2.1 Competent authority for EIA and determination of environmental acceptability 2.2 Review body for EIA 2.3 Specification of sectoral authorities' responsibilities in the EIA process 2.4 Level of coordination with other planning and pollution control bodies
	EIA process 3.1 Specified screening categories 3.2 Systematic screening approach 3.3 Systematic scoping approach 3.4 Requirement to consider alternatives 3.5 Specified EIA report content 3.6 Systematic EIA report review approach 3.7 Public participation in EIA process 3.8 Systematic decision-making approach 3.9 Requirement for environmental management plans 3.10 Requirement for mitigation of impacts 3.11 Requirement for impact monitoring 3.12 Experience of SEA
Foundation criteria	1 Existence of general and/or specific guidelines including any sectoral procedures 2 EIA system implementation monitoring 3 Expertise in conducting EIA 4 Training and capacity-building

Source: Ahmad and Woods, 2002

Ahmad and Woods' criteria have been used in other country contexts for comparing and evaluating EIA systems (Khosravi et al., 2019a). For example, El-Fadl and El Fadel (2004) used it to compare the EIA system of the Middle East and North African countries, whilst Badr (2009) and Panigrahi and Amirapu (2012) used it to evaluate the EIA system of Egypt and India respectively. Table 3.1 illustrates how extensively Ahmad and Wood's (2002) criteria have been used to evaluate EIA systems internationally.

Nadeem and Hameed (2008) also used Ahmad and Wood's (2002) criteria but combined it with two groups of criteria from Wood (1995) and Fuller (1999) to review the EIA system of Pakistan. This was

found to be especially useful in that country's context as there was no history of conducting EIA reviews. Their new set of criteria are listed in Table 3.3 and consists of stages of EIA process, legislative provisions, guidelines and institutional set up for EIA. These helped to provide a comprehensive evaluation framework.

Table 3.3. EIA evaluation criteria by Nadeem and Hameed, 2008

Category	Criterion
EIA legislation	1.1 Legal provisions for EIA 1.2 Legal Provisions for appeal by the developer or the stakeholder against decisions 1.3 Legal specification of time limits for approval and appeal 1.4 Legal provisions for SEA
EIA administration	2.1 Competent authority for EIA screening and approval 2.2 EIA Review body 2.3 Specification of responsibilities of sectoral authorities in the EIA process 2.4 Level of coordination with other planning and development
EIA process	3.1 Specification of screening categories 3.2 Screening approach 3.3 Scoping approach 3.4 Requirement for consideration of alternatives 3.5 Specification of EIA report content 3.6 Systematic approach for the review of EIA report 3.7 Public participation in EIA process 3.8 Systematic approach for decision-making and approval 3.9 Specified requirement for environmental management plans 3.10 Specified requirement for mitigation of impacts 3.11 Specified requirement for monitoring of impacts 3.12 SEA Experience

Source: Adapted from Wood (2003); Ahmad and Wood (2002); Fuller (1999).

3.2 EIA effectiveness theoretical perspective

This section looks at EIA effectiveness, presents various definitions, and explains EIA effectiveness categorisations and various EIA effectiveness criteria. This supports the second objective 'to develop a framework of EIA effectiveness criteria for the Iranian water sector' and the third of 'to examine the effectiveness of the EIA system in ULB'.

3.2.1 Concept of EIA effectiveness

There is a growing body of professional literature under the heading of EIA effectiveness (Runhaar et al., 2013; Khosravi et al., 2018). The first attempt to study the effectiveness of EIA was conducted by IAIA and culminated in the International Effectiveness Study (Sadler, 1996).

The first challenge is to consider what 'EIA effectiveness' means. Since 1996, several scholars have researched EIA effectiveness. Sadler defines this as the extent to which an EIA achieves its intended goals (1996, p.37; Bond and Morrison-Saunders, 2013; Momtaz and Kabir, 2013). On the other hand, Partidario (2000) defines effectiveness as "*A function of the extent it influences and adds value to decision making*" (p.647). Similar to Sadler, Elling (2009) "*has used the term of effectiveness to characterise the potential outcome of a goal-directed process''* (p.129). Arts et al. (2012) stated that EIA is effective when it achieves its objectives, which include the incorporation of environmental considerations in decision-making and the enhancement of the environmental awareness among proponent authorities. Therefore, there is variety of perspectives and expectations on this topic by different authors due to their professional background (Morgan et al., 2012; Van Doren, 2013). The common factor in the different definitions is the achieving of intended EIA objectives.

Based on literature, EIA effectiveness can be described in terms of the extent to which it works (procedurally) to achieve its objectives (substantively). EIA Objectives include incorporation of environmental considerations in decision-making based on reasonable time and cost (transactively) and the enhancement of the environmental awareness among stakeholders (Arts, 1998; Arts et al., 2012; Runhaar and Driessen, 2007; Wood, 2003).

3.2.2 EIA effectiveness categorisation

The second challenge of EIA effectiveness is to consider how to measure this 'effectiveness'. Categorising effectiveness and developing criteria is a useful approach (Bond et al., 2013; Khosravi et al., 2018). The first category was defined by Sadler (1996) and could be considered a milestone. He divided effectiveness of EIA process into three categories (Theophilou et al., 2010; Chanchitpricha and Bond, 2013):

- **Procedural**: Does the EA process conform to established principles?
- **Substantive**: Does the EA process achieve the objectives set; for example, support well-informed decision-making and result in environmental protection?
- **Transactive**: Does the EA process deliver these outcomes at least cost in the minimum time possible? (Sadler, 1996, p.39; Theophilou et al., 2010).

Following this, Baker and McLelland (2003) added normative effectiveness to these categories (Bond and Morrison-Saunders, 2013; Chanchitpricha and Bond, 2013):

- **Normative**: Does the EA process achieve its normative goals, such as sustainable development (Gallardo and Bond, 2011).

Additionally, Bond et al. (2013) in following the example of Jha-Thakur et al. (2009) added pluralism and learning as being a key goal of EIA and a measure of effectiveness (Khosravi et al., 2018). Their reasoning was that a good EIA should change the values and way of thinking of stakeholders about the environment and therefore benefit the EIA process in the future (Bond et al., 2017).

Since 1996, scholars have tried to evaluate the effectiveness of EIA processes using various categorisations. Bond et al. (2013) have summarised different type of EIA effectiveness categories conducted by different researchers, and this section further complements this effort (Table 3.4).

Based on this literature review, EIA effectiveness can be divided in to four categories (Veronez and Montano, 2015; Chanchitpricha and Bond, 2013), and these categories will now be discussed.

Table 3.4. Different categories in EIA effectiveness researches

Focus	Categories	Authors
Establishing concepts	Procedural, substantive and transactive	Sadler 1996 Sadler 2004
	Procedural, substantive, transactive and normative	Baker and McLelland 2003 Chanchitpricha and Bond 2013 Arts et al. 2012
	Procedural, substantive, transactive and normative (including aspects of pluralism and knowledge/learning)	Bond et al. 2012 Bond et al. 2013 Bond et al. 2017
	Procedural, substantive	Jha-Thakur and Fischer, 2016
Empirical analysis	Procedural, substantive	Fischer, 2005 Hapuarachchi et al. 2016 Khosravi et al., 2018
	Substantive and transactive	Theophilou et al. 2010
	Procedural, substantive and transactive	Baker and McLelland 2003
	Procedural, substantive, transactive and normative	Gallardo and Bond 2011
	Procedural, substantive, transactive and normative (including aspects of pluralism and learning)	Therivel, 2013 Morrison-Saunder and Pope, 2013 Retief 2013

Source: Adapted the framework from Bond et al. (2013)

3.2.2.1 Procedural effectiveness

Most EIA evaluation research has focused on procedural effectiveness of EIA (Cashmore et al., 2004; Van Doren et al., 2013; Arts et al., 2013). Procedural effectiveness considers the principles of the impact assessment process (Baker and McLelland, 2003; Sadler, 1996; Chanchitpricha and Bond, 2013), and different definitions have been proposed:

- *"Procedural: Does the EA process conform to established provisions and principles?"* (Sadler, 1996, p.39).
- *"Procedural effectiveness expresses that the assessment complies with acceptable standards and principles."* (Gallardo and Bond, 2011, p.2287).
- *"Examination of the practice involves finding out how the policy was applied or what procedures were used"* (Baker and McLelland, 2003, p.585).

3.2.2.2 Substantive effectiveness

Few researchers have focused on the "substantive" effectiveness of EIA (Arts et al., 2012), which assesses the outcome of the EIA process (Jay et al., 2007; Hapuarachchi et al., 2016). Substantive effectiveness is investigated where EIA helps to integrate environmental aspects in decision-making (Sadler 1996; Baker and McLelland 2003; Veronez and Montano, 2015). There is a distinction between substantive effectiveness and procedural effectiveness in EIA studies. While evaluation of procedural effectiveness can provide insights into the quality of the EIA report; substantive effectiveness contributes to an understanding of the influence of the tool in environmental planning (Doren et al., 2013). Different definitions of substantive effectiveness have been proposed:

- "*Does the EA process achieve the objectives set*"; for example, support well-informed decision-making and result in environmental protection? (Sadler, 1996, p.39).
- "*Substantive effectiveness indicates the achievement of expected objectives.*" (Gallardo and Bond, 2011, p.2287).
- "*Substantive SEA effectiveness is defined as the extent to which SEA accomplishes its purposes or produces expected results*" (Doren et al., 2013, p. 121).
- "*Examination of performance involves finding out what objectives were met as a result of the application (the practice)*" (Baker and McLelland, 2003, p.586).

3.2.2.3 Transactive effectiveness

This dimension is assessed on the basis of cost and time consumed during the EIA process (Chanchitpricha and Bond, 2013). There is little research on this aspect of effectiveness (Chanchitpricha and Bond, 2013; Veronez and Montano, 2015), although some definitions could be found:

- "*Does the EA process deliver these outcomes at least cost in the minimum time possible, i.e. is it effective and efficient?*" (Sadler, 1996, p.39; Theophilou et al., 2010).

- "*Examination of proficiency involves finding out how resources were used in achieving objectives*" (Baker and McLelland, 2003, p.586).
- "*Transactive effectiveness denotes that the outcomes have been obtained with the least cost in the minimum timeframe*" (Gallardo and Bond, 2011, p.2287).

3.2.2.4 Normative effectiveness

A 'norm' is defined as "*a typical pattern*" as well as "*widely accepted behaviour within a society*" (Chanchitpricha and Bond, 2013, p. 71). Normative effectiveness was demonstrated in a few studies (Baker and McLelland, 2003; Kauppinen et al., 2006; Stoeglehner et al., 2009) but has not been systematically evaluated. It has been defined by various researchers as follows:

- "*The extent to which the process achieves its normative goals, such as sustainable development*" (Gallardo and Bond, 2011, p.2287).
- "*The extent to which normative goals, defined as ''combination of social and individual norms' is achieved*" (Bond and Morrison- Saunders,2013, p.45).
- This dimension is related to the improvements in the process based on lessons learned or incremental changes in the process (Cashmore et al., 2004).
- Normative effectiveness is related to the sense of principles that society agrees, as well as the sense of accepted behaviours within society (Chanchitpricha and Bond, 2013).

3.2.3 EIA effectiveness' criteria

This research will adopt an integrative approach combining procedural, and substantive in order to analyse the effectiveness of EIA system in ULB. EIA effectiveness criteria therefore need to be defined and the EIA effectiveness criteria to be used in the evaluation framework are described in this section.

Various reviews of international best practice have been undertaken in order to formulate a criteria framework to evaluate the EIA system's effectiveness in the ULB. Frameworks found in the literature usually focus on either the **project level** or the **system level**. At a project level, individual EIA projects

are evaluated in practice. At a system level, the performance of EIA system components is evaluated (Kolhoff et al., 2009; Khosravi et al., 2019a). This research has designed the criteria framework to focus on the effectiveness at the system- rather than project level. In doing so, two aspects require attention (Van Doren et al., 2013):

1. 'Best practice' criteria relating to the assessment of the EIA system.
2. The context in which EIA is being applied, as discussed in the last section.

This section describes some of the factors influencing EIA effectiveness, based on the categories of effectiveness of procedural, substantive (see also Table 3.6).

3.2.4 Procedural effectiveness criteria

Procedural effectiveness criteria are designed to evaluate how well different steps of the EIA process are designed and implemented.

3.2.4.1 Scoping:

Scoping is a critical step in shaping an EIA report as it involves deciding upon the significant issues should be covered, the nature and extent of these topic subsequently in an EIA report (Wood et al., 2006). Ineffective scoping creates the risk that unnecessary work will be conducted or that the significant consequences are missed (Snell and Cowell, 2006). Therefore, the existence of scoping and public participation in scoping is one of the main factors influencing EIA quality (Kolhoff et al. 2012) and EIA should include early public participation in the scoping stage for effective EIA (Bond et al. 2004; Khosravi et al., 2018).

3.2.4.2 Assessment of alternatives:

Although the identification and comparison of alternatives are central to the application of EIA as a problem-solving process, this is poorly represented and carried out in many countries (Kamijo and Huang, 2016). Many developing countries do not assess alternatives, and also some established EIA systems in developed countries like the UK system do not contain obligations to assess alternatives considered for a proposed project which have been frequently criticised (Arts et al., 2012).

3.2.4.3 Public participation:

Public participation is a procedural requirement in many EIA systems (Hapuarachchi et al., 2016). The public should be informed in a timely manner and adequately on the findings of the EIA study and have the opportunity to respond (Christensen et al., 2003; Kolhoff et al., 2009). Public participation, particularly the participation of stakeholders, is a key component of EIA and helps to bring procedural democracy and acceptability of decision-making into the EIA process (Nadeem and Hameed, 2008; Khosravi et al., 2019b). Public participation increases the credibility of end results and the final decision and assures that all public concerns are considered (Runhaar and Drissen, 2007). However, public participation cannot effectively work without embedding a culture of public participation into society (Purnama 2003; Marara et al. 2011; Khosravi et al., 2019b).

3.2.4.4 Transparency of EIA process:

EIA is meant to be an open process that enables discussion and participation by a variety of actors. It aims to increase the transparency and broaden the information base of decision-making (Wilkins, 2003; Pölönen et al., 2011). Transparency is an element of EIA effectiveness which adds legitimacy (Arts et al., 2012). A transparent and clear process is the basis for effective participation and this participation will clarify the different opinions and substantially influence the quality of the EIA output (Fischer, 2005). Public participation brings transparency in the EIA system (Kumar Dara et al., 2017). Thus, by improving public participation in the process, the transparency of the system will be improved, and acceptability increased (Marara et al., 2011).

3.2.4.5 Implementation of Mitigation Measures:

Proper implementation of mitigation measures along with monitoring and community participation are integral elements of an effective EIA system. It is argued that the desired substantive outcome of an EIA occurs when all mitigation measures recommended by the EIA reports are completely implemented (Momtaz and Kabir, 2013). There have been several studies undertaken in developed countries on the implementation of mitigation measures but there are a limited number of studies

on the implementation of mitigation measures in developing countries, including Sanchez and Gallardo (2005) in Brazil and Nadeem and Hameed (2010) in Pakistan.

3.2.4.6 EIA follow-up:

EIA follow-up is important in achieving EIA effectiveness (Sadler, 2004; Wood, 2003; Arts et al., 2012). Regulators should determine the need for EIA follow-up and ensure that it is implemented well (Morrison-Saunders et al., 2007). However, requirement through legislation is the simplest method for ensuring uptake and doesn't guarantee implementation even if adequate enforcement measures are taken (Jones and Fischer, 2016). Other barriers will still be valid even if legislation is present. In this context, Braniš and Christopoulos (2005) evaluated the Czech EIA system and follow-up provisions, and concluded that the Czech government had legislated for monitoring impacts through the EIA Act in 1992. However, monitoring programmes were not implemented due to the costs to the developer and lack of institutional support such as guidance or available expert knowledge (Jones and Fischer, 2016). Jones and Fischer (2016) investigated the main barriers of an effective EIA follow-up in the UK, and they concluded that the main barriers were lack of appropriate legislation, implementation costs, and lack of enforcement. Besides, the quality of the EIA reports is the main precondition for effective follow-up (Jha-Thakur et al., 2009; Jones and Fischer, 2016). Based on Jha-Thakur et al. (2009) a follow-up design needs to determine roles and responsibilities, scope of follow-up issues and methodologies for follow-up programmes.

3.2.5 Substantive effectiveness criteria

3.2.5.1 Decision-making:

An early start between decision makers and EIA team allows decision-makers to use the information from the EIA to review and discuss the project. It means EIA should affect the decision-making process and a close cooperation between EIA team and design team increases the chance that the environmental information influences the knowledge of actors in the designing process (Van Doren et al., 2013). This is supported by Hildén et al. (2004) who argue that when the environmental

assessment is initiated after key decisions on the project have already been made, it is almost impossible to influence the project, even if it has not yet been formally adopted.

3.2.5.2 Communication and Integration

Integration is defined as cooperation and communication between EIA team and decision-makers during the decision-making process (Van Doren, 2012). Effective integration is needed to ensure the EIA adds more value to decision-making (Geneletti 2014, p. 17; Kamijo and Huang, 2016). Clear communication of EIA results between different actors makes them aware of how their decisions can influence the environment (Kaljonen, 1999; Fischer, 2005). Increasing environmental awareness of participants leads to the reformulation of policy issues (Fischer, 2005). Furthermore, environmental awareness supports the EIA system and can influence the implementation of the EIA in practice.

Table 3.5 summarises the criteria which have been used in examining the EIA effectiveness in ULB.

Table 3.5. EIA effectiveness Criteria for ULB

Effectiveness dimension	Criterion	Definition	Adapted from
Procedural effectiveness criteria	Scoping	Scoping means level of detail of the assessment and the information to be included in the EA (Fischer, 2007: 29). It provides guidelines on alternatives and impacts that should be studied (Arend et al., 2009).	IAIA, 1999; Doren et al., 2013; Retief, 2006; Sadler and Verheem, 1996.
	Consideration of cumulative impacts	Cumulative impacts are combined impacts of one or more activities on the environment (Franks and al., 2010).	IAIA, 1999; Arts et al., 2012; Bond et al., 2013.
	Assessment of alternatives	Alternative methods and locations should be considered in EIA.	IAIA, 1999; Bassi et al., 2012; Arts et al., 2012; Hapuarachchi et al., 2016
	Stakeholder participation	Stakeholders including organisations, communities that have a direct stake in the Basin especially agriculture communities and water resource management organisations.	Arend et al., 2009; Arts et al., 2012; IAIA 2002; Polido et al, 2016; van Doren et al., 2013
	EIA follow-up implementation	Monitoring compares the outcomes with the predictions (Glasson et al., 2012).	Arend et al., 2009; Bassi et al., 2012; Nilsson et al., 2009; IAIA, 2007; Jha-Thakur, 2006; Partidário and Fischer, 2004;
Substantive effectiveness criteria	Communication and integration	Communication between EIA and project design practitioner during the Design process. Integrating EIA into the planning process is a necessary precondition of EIA effectiveness (Stoeglehner et al., 2009).	IAIA, 2002; Fischer and Gazzola; 2006 Doren et al., 2013; Stoeglehner et al., 2009; Hapuarachchi et al., 2016
	Decision-making	EIA should begin as early as feasibility study of project design to have substantive effect on decision.	IAIA, 1999; Van Doren et al., 2012; Chanchitpricha and Bond 2013.

3.2.6 The role of contextual factors in EIA effectiveness

Extensive research has been conducted to evaluate EIA effectiveness (Runhaar et al. 2013; Arts et al. 2012; Phylip-Jones and Fischer 2013; Fischer and Gazzola 2006; Khosravi et al. 2018; Khosravi et al., 2019b). Most EIA effectiveness globally aim at procedural and substantive elements (Arts et al., 2012; Khosravi et al., 2018). To date little attention has been given to the overall context within which EA is happening (Fischer 2005; Khosravi et al. 2018). However, any review of effectiveness needs to consider the context in which EA operates in order to be meaningful (Morgan 2012; Sadler 1996; Bond and Pope 2012; Veronez and Montano 2015; Khosravi et al. 2018). Considering the context in which EIA is operating allows EIA practitioners to have realistic expectations with regards to the EIA effectiveness (Hilding-Rydevik and Bjarnadóttir, 2007; Runhaar and Driessen, 2007; Van Doren et al., 2013). Kolhoff et al. (2018) explained that three groups of factors including contextual factors cause low EIA performance in low- and middle-income countries (Khosravi et al., 2019b):

1. EIA legislation that is unclear, given the capacities and the political context (Bitondo, 2000; Marara et al. 2011; Momtaz and Kabir 2013; Kolhoff et al. 2009, 2013).
2. Weak organisational capacities (Wood 2003; Van Loon et al. 2010; Clausen et al. 2011; Marara et al. 2011; Momtaz and Kabir 2013), including weak monitoring and enforcement capacities (Khadka and Shrestha 2011).
3. Contextual factors such as the political system, the socio-economic situation, and the legal framework (Kakonge 2006; Kolhoff et al. 2009, 2013; Marara et al. 2011; Momtaz and Kabir 2013; Wells-Dang et al. 2016).

As a result, it is vital to identify what contextual factors influence the effectiveness of EIA system in terms of leading to the incorporation of environmental values in decision-making.

Contextual influence was first argued by Sadler (1996, p. 229), saying that "*emerging policy and institutional realities and broad societal changes*" are changing the context in which EIA is operated (Hapuarachchi et al., 2016). Furthermore, Cherp (2001), Annandale (2001) and Espinoza and Alzina (2001) described the importance of the context in which the EIA system functions to understand its

strengths and weaknesses. Cherp (2001) also provided criteria to evaluate the context of an EIA system. This subject has been further scrutinised by other scholars (see Fischer, 2003, 2005, 2007; Runhaar and Drissen., 2007; Bina et al., 2011; Arts et al., 2012; Van Doren et al., 2013; Hapuarachchi et al., 2016). Momtaz and Kabir (2013) investigated effectiveness of EIA systems in developing countries, and they regarded political will, bureaucratic culture, environmental awareness among the proponents and local community, and favourable socio-economic conditions as contextual factors. Contextual factors, such as socio-economics and politics, are very different in developing countries to developed countries where EIA originated (Marara et al., 2011) and are more influential on EIA effectiveness in developing countries (Kolhoff et al., 2009). Failure to consider context has been reported as a main reason for low EIA effectiveness in these countries (Kolhoff et al., 2018).

As Table 3.6 shows, there is no commonly accepted framework to study contextual factors (Khosravi et al., 2018; Kolhoff et al., 2016), and some scholars have built contextual factor dimensions upon other works. The most frequently mentioned factors include the political system, the socio-economic situation, and the institutional and legal framework (Cherp 2001; Annandale 2001; Mao and Hills 2002; Bitondo 2007; Clausen et al. 2011; Wells-Dang et al. 2016; Kolhoff et al. 2016; Khosravi et al., 2019). Iran's contextual factors have been identified through professional literature and the first set of interview with Iranian EIA actors in Chapter 7, and are explored further during the second set of interviews, discussed in Chapter 8.

Table 3.6. Different contextual factors frameworks by different scholars

Scholar	Contextual factor frameworks
Fischer (2007)	Formal requirements and provisions Clear goals Appropriate funding, time and support for EA Willingness to cooperate Clear assessment boundaries Acknowledgement of uncertainties.
Runhaar and Driessen (2007)	Degree of consensus about values regarding the policy issue Certainty about the knowledge base Characteristics of the decision-making process (openness of decision-makers)
Arts et al., (2012)	Characteristics of EIA results Course of EIA-process Characteristics of EIA actors Characteristics of the decision-making context
Van Doren et al. (2013)	Certainty about the knowledge base Agreement on norms and values Characteristics of the decision-making process (openness of decision-makers towards environmental values).
Momtaz and Kabir (2013)	Political will Bureaucratic culture Environmental awareness among the proponents and local community Favourable socioeconomic conditions
Hapuarachchi et al. (2016)	Consultation and public participation Policy context Transparency and Accountability Political will Coordination Funding conditions

3.2.6.1 Characteristics of EIA Legal framework

"Without formal requirements and provisions, EIA is bound to be 'toothless' and highly sensitive to political struggles and power games" (Fischer 2005, p. 414; Khosravi et al., 2018). Clear legal mandate is necessary for conducting an EIA study (Gallardo and Bond, 2011). Characteristics of EIA legislation can affect on the effectiveness of the EIA system, for example the presence of "follow-up" requirements (Arts et al., 2012; Sadler, 2004; Wood, 2003). Thus, it is necessary to scan the current legislative arrangements as inadequate and ambiguous legislation may impose substantial costs,

uncertainty in the application of EIAs, and cause delays in achieving objectives (Momtaz and Kabir, 2013).

3.2.6.2 Culture of decision-making

Culture of decision making of a country can affect some steps of EIA process and the EIA approach suited to a democratic country may not suit a country with centralised government. For instance, stakeholder involvement in decision-making is a common practice in democratic systems, but civil society plays hardly any role in more authoritarian systems (Khusnutdinova, 2004; Kolhoff, et al., 2009). Stakeholder involvement and public participation are inevitable in a democratic society, and this can distribute the balance the power among different stakeholders (Purnama, 2003; Chen, 2013). Arts et al. (2012) identified that planning traditions of a country can influence the implementation of EIA systems. For example, the United Kingdom and the Netherlands have the same EIA legal basis, as both are based on the European Union Directive 85/337/EEC but have distinctive planning traditions and EIA is implemented in different ways due to this (Arts et al., 2012). The dominant decision-making culture in Iran is centralised and this can hinder some elements of an EIA system such as public participation.

3.2.6.3 Political support

Strong political support is one of the most important factors in the development of an effective EIA system (Partidario, 2000; Fischer, 2006; Sadler, 1996; Fischer, 2002; Fischer, 2007). In some cases, EIA requirements are present but there is no political support to conduct the EIA. In this context, political will is considered as a barrier to effectiveness of EIA application and EIA actors are subject to political pressure. Wayakone and Makoto (2012) state that the challenges for EIA are political rather than technical, and therefore to make EIA more than a ritual, changes in the attitudes and behaviour of political leaders and public officials will be needed (Chen et al., 1999).

3.2.6.4 Human capacity

The capacities of the actors and organisations participating in an EIA system determine the extent to which regulatory framework objectives will be achieved (Kolhoff et al., 2009). The capacities include:

- **Availability of human resource**: Human resources are crucial factors strengthening the effectiveness of EIA process (Harris et al., 2009; Schirnding, 2005; Inmuong et al., 2011; Cameron et al., 2011; Kang et al., 2011; Harris and Spickett, 2011). Kolhoff et al. (2009) see the quality and the number of staff as crucial as they are executing day-to-day tasks concerning EIA, and believe that EIA performance is often weak due to insufficient skills. This weakness has been reported in many countries, such as in India where understaffing prevents EIA from being implemented effectively (See Jha-Thakur, 2011).
- **Experience of EIA actors**: Experience of EIA actors such as proponents, consultants and competent authorities could influence EIA report quality (Barker and Wood, 1999; Kolhoff et al., 2009), and eventually effectiveness of an EIA system. An example is EIA consultants that carry out EIA studies on behalf of the proponent, where the quality of the studies depends on their skills, access to knowledge, funds allocated and time available (Kolhoff et al., 2013). Quality assurance mechanisms should therefore be included in the regulatory framework that allows only qualified EIA consultants to conduct EIA studies.
- **Openness of EIA actors towards environmental values**: Usage and influence of the EIA will be diminished when decision-makers are not receptive to environmental values during decision-making (Van Doren et al., 2013). For instance, the proponent as a member of EIA actors should have an open attitude towards changes to the project's design during the EIA process.

3.2.6.5 Financial capacity

Several scholars have identified financial issues as a context element that may affect EIA application. Chanthy and Grünbühel (2015) believe that restricted funding for EIA affects the quality of EIA process. Although the quality of an EIA report also depends on the adequacy of funding allocated for EIA, there still seems to be a lack of recognition among the proponents that EIA is detailed work and needs adequate funds to perform tasks effectively and efficiently (Momtaz and Kabir, 2013). Modak and Biswas, (1999) suggest that 1 to 2.5% of the total project cost should ideally be allocated for an EIA study.

3.3 Chapter summary

EIA has been globally accepted as a decision-making support tool in project planning (Morgan, 2012; Silva Dias et al. 2019). The effectiveness of EIA, in terms of the extent to which it is meeting its objectives, has been frequently discussed ever since it was first formally introduced in the United States in 1969 (Cashmore et al., 2010; Lyhne et al. 2017). The main focus in this context has usually been on aspects of procedural and substantive effectiveness (Fischer, 2005; Khosravi et al. 2018). However, the context in which EIA operates affects its effectiveness (Kolhoff et al. 2016). Therefore, these contextual factors should be considered in evaluating EIA effectiveness.

4 Overview of water sector and EIA

This chapter provides an overview of global water topics that are relevant to this research and connects it with the role that EIA can play in solving some of the related issues. The chapter therefore commences with an introduction to water use in different sectors, followed by water crises and the role of water infrastructure in response to them. The third section reviews the impact of water infrastructure on the environment. Section four describes typical examples of lakes that have dried due to water exploitation. Section five explains the role that EIA can play in reducing the negative impacts of water infrastructure and the last section provides a summary.

4.1 Water use in different sectors across the world

Von Braun (2008) and Bekchanov et al. (2016) estimated that the agricultural sector accounts for 70% of the total water drawn globally from both surface water and groundwater resources. This percentage varies between continents and is highly dependent on both climate and the role of agriculture in the economy (FAO 2015). Figure 4.1 illustrates the water withdrawal ratios by continent, showing that rates vary from 82 percent in Africa to 21 percent in Europe.

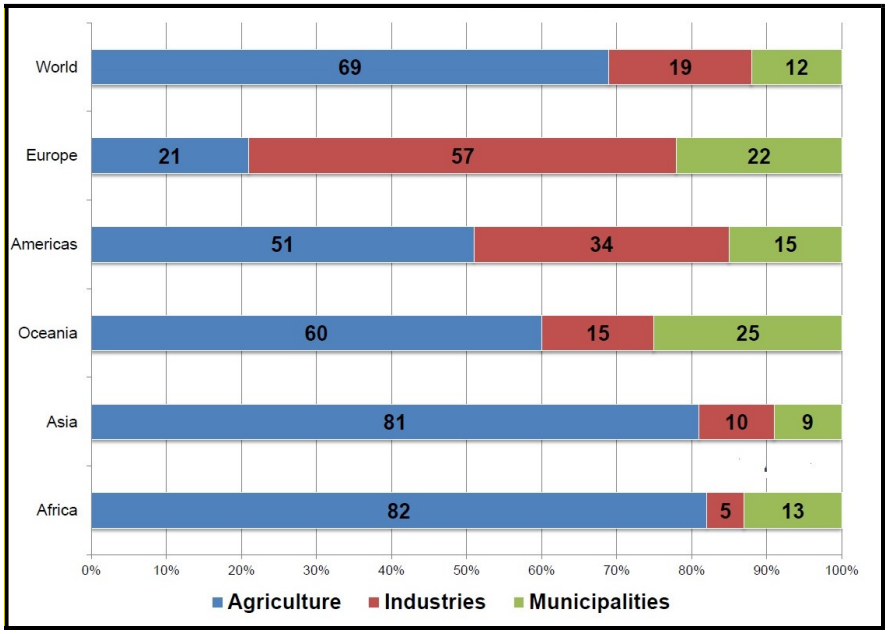

Figure 4.1. Share of water withdrawals by continent and sector (%)

Source: FAO's Information System on Water and Agriculture (2015)

4.2 Water scarcity around the world

Increased human population has caused water shortages, particularly in semi-arid and arid region across the world (Bekchanov et al., 2016). Research by FAO (2017) estimates that water withdrawal has grown in the last century 1.7 times faster than the population, and that food production has increased by more than 100 percent over the last 30 years. Sustainability of water use is questionable since demand for agricultural, industrial, and domestic uses continues to increase, and that 60 percent more food will be needed by 2050 to meet the needs of a growing global population (FAO, 2017).Building dams and reservoirs is one of the most common approaches to cope with water shortage (Baldassarre et al., 2018). Humans develop dams and extract water for irrigation to supply food and energy for growing populations (Biemans et al., 2011; Shadkam et al., 2016), and this approach continues at a rapid pace in the developing world where growth of water and electricity demand is strongest (Pirestani et al., 2011). The increasing pressure on water resources is illustrated as scarcity in Figure 1.1. This leads to tension between people and industry, and creates pressures on the environment (FAO, 2017).

The resulting decline in water ecosystems is threatening the economic, social, and environmental security of society and ecosystems. A serious challenge is how to manage water without harming natural resources.

4.3 Dams and impact on environment

The International Commission on Large Dams (ICOLD) defines large dams as those where height exceeds 15 meters from the foundation, or if the reservoir volume is more than 3 Mm^3 (Jalilov, 2010). Approximately 60,000 dams in the world can currently be classified as large dams according to these definitions (ICOLD, 2018). Among the single purpose dams, 48 % are for irrigation, 17% for hydropower (production of electricity), 13% for water supply, 10% for flood control, 5% for recreation, and less than 1% for navigation and fish farming.

Dams are one of the most important constructions in water infrastructure development with positive and negative effects on environment (Pirestani et al., 2011). Although dams have some important societal benefits such as flood control, water supply and hydropower, they come with substantial environmental costs (Bruno and Siviglia 2012). These costs include global freshwater biodiversity decline (Dudgeon et al. 2006), extinction of fish species (Xenopoulos et al. 2005, Reidy Liermann et al. 2012), and degradation of floodplains (Opperman et al. 2010). Nilsson et al (2005) has revealed that already 59% of the world's large river systems are fragmented by dams. Therefore, there is mounting pressure on policymakers and resource managers to realize the potential benefit of water infrastructure development whilst ensuring the long-term sustainability of water ecosystems (Grantham et al., 2014). The sections below describe some negative impacts of dams on physical, biological and social environments.

4.3.1 Impact of dams on the physical environment

Erosion and Sedimentation: Dams trap sediment and this leads to physical changes downstream of the reservoir site, in the reservoir itself, and in some cases also upstream (Kantoush et al., 2010). Altering of the natural sediment load that was previously carried by free-flowing rivers is particularly obvious. Sediment-laden upstream waters slow on entering the dam, suspended sediments drop out and thick layers of silt then form on the reservoir bottom. Water released following this is consequently more free of sediment, and is more able to erode downstream riverbanks. Other effects include riverbed incision, riverbank instability, upstream erosion in tributaries, groundwater over drafting and damage to various infrastructure (Batalla, 2003; Kantoush et al., 2010).

The Effects of Dams on Riverine Ecosystems: Most of the world's large rivers are fragmented by dams (Jagera et al., 2001). Fragmentation will change a riverine system to a reservoir habitat (Jagera et al., 2001), and the effects of this can be seen on migratory fishes, waterfalls and geographic distribution of freshwater animals (Fuller et al., 2015).

Water Temperature: temperature is a critical parameter that controls the overall health of aquatic ecosystems in rivers (Webb et al., 2008), and its influence on water requirements for industry and

aquaculture can be of economic importance. Ling et al. (2017) find that dams often alter river water temperature. Reservoirs also alter the upstream and downstream temperature profiles of the water. Even within a reservoir, thermal stratification is common occurrence in summer as upper water layers are warmed and cooler waters remain underneath. In the winter months this is often inverted, with upper layers being cooled, reducing the thermal stratification, which may even disappear as a result of full vertical mixing. Therefore, downstream water temperatures may be substantially changed by the reservoir released water at different temperatures (Ling et al., 2017).

4.3.2 Impact of dam on biological environments

Dam construction directly impacts fish biodiversity, and both transforms and fragments riverine habitats (Kano et al., 2016; Winemiller et al., 2016). Fish movement upstream for purposes of ovulation and feeding is prevented and thus fish population decreases significantly (Stott and Smith, 2001). Biological life both in reservoirs and in dam's lower part is changed rapidly. Repeated changes in water level can cause some species to begin living underwater, and these regions may be changed to marshy lands or sandy floors depending on the soil structure (Tahmicioglu et al., 2007; Zafarnejad 2006). The relationship between water, soil and the food materials, which are settled after floods will change in lower part of the dams over time. These forced transformations affect plants, animals, agrarian methods in the region, and this influence can extend by several kilometers (Pirestani et al., 2011).

4.3.3 Impact of dam on social environments

Dams affect the social, cultural and economic structure of the region considerably. The most challenging social impact of dam is the displacement of native people (Sapkale, 2016). Displacement has consequential social effects such as changes in household size and structure (Lerer and Scudder, 1999); changes to employment and income-generation; altered access and use of land and water resources; changes to social networks and community integrity (Fuggle and Smith, 2000); changes in the nature and magnitude of various health risks (Lerer and Scudder, 1999; McMillan, 1995); and often a disruption of the psycho-social wellbeing of displaced individuals (Scudder, 2005; Tilt et al.,

2009). It is estimated that there were approximately 40–80 million people who were subjected to dam-induced displacement and resettlement from 1950 to 2000 (Huang et al., 2018). Increased transmission of malaria has been directly linked to the construction of dams in Southeast Asia and Africa, and it has been noted that toxins can accumulate and leech into water that will be released into the water supply used by people (Pirestani et al., 2011).

4.4 Prominent examples of lake shrinkage due to water withdrawals

Shrinkage of vast lakes is another highly visible impact of irrigation withdrawal (Wurtsbaugh et al., 2017). Significant manifestations of such human-induced droughts can be found in arid and semi-arid regions (Khazaei et al., 2019; Wurtsbaugh et al., 2017). The largely arid climate of these basins makes it essential to use irrigation for agricultural production (Bekchanov et al., 2016). Figure 4.2 shows the world's declining large saline lakes. These lakes become sources of fine dust that harm human health and agriculture when they are desiccated (Griffin, 2004; Wurtsbaugh et al., 2017), an impact that has been particularly well documented in the Aral Sea, where agricultural water withdrawals have exposed 12,700 km2 of lakebed (Crighton et al., 2011; Indoitu et al., 2015). In the much smaller Owens Lake in California airborne dust has frequently exceeded US air-quality standards for large particulate particles (PM10) and repeatedly increased the prevalence of asthma, lung infections and other respiratory diseases in the area (Kittle, 2000). The City of Los Angeles as a result will consequently have to spend US$ 3.6 billion over 25 years on dust mitigation from the dry bed of Owen's Lake, an amount that exceeds the value of the diverted water (Wurtsbaugh et al., 2017).

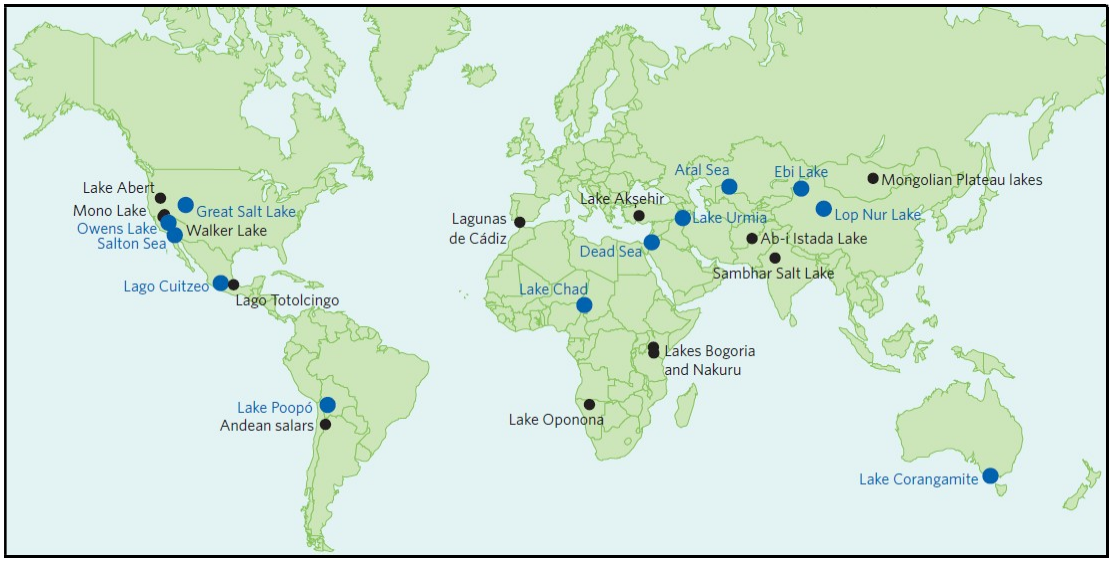

Figure 4.2. The world's declining saline lakes

(Larger symbols represent lakes larger than 250 km2) (Wurtsbaugh et al., 2017)

Despite the obvious symptoms, water withdrawals are predicted to increase by 50% by 2025 in developing countries where the water withdrawal already exceeds minimum recharge levels. This will lead to further reduction in river volume and the depletion of groundwater (Topcu and Kirda, 2013). This can intensify the environmental impact of lake shrinkage. Examples are provided below of shrinking lakes primarily caused by increased water withdrawals for agriculture and other consumptive uses (Wurtsbaugh et al., 2016).

Aral Sea: Agricultural water development in the Aral Sea watershed has reduced lake area by 74% and volume by 90%. Large-scale water diversions for irrigation began in the 1960s under the Soviet regime. The diversions were largely intended for the massive expansion of cotton cultivation and transformed the agricultural landscape of the region (Bekchanov et al., 2016).

Lake Urmia: This Iranian body of water has suffered a similar fate as many saline lakes around the world (Wurtsbaugh et al., 2017) as its surface area has dramatically decreased by around 88% over the preceding twenty years (AghaKouchak et al., 2015; Khazaei et al., 2019). Different studies have attributed the decline in lake water content to extensive human activities in the Lake's catchment area, particularly the extensive dam building that has taken place since the 1990s (Alborzi et al., 2018; Hassanzadeh et al., 2012; Khoshtinat et al., 2015; Khosravi et al., 2018).

Owens Lake: This lake is located in eastern California at end of Owens Valley, and was primarily supplied by the Owens River (Lancaster et al., 2015). It was completely desiccated by 1940 after the City of Los Angeles diverted streams for agricultural and urban use (Wurtsbaugh et al., 2017).

Salton Sea: Another of California's water bodies, Salton Sea is a terminal lake that has suffered a recent and precipitous decline of over 7 meters since 2000. This has been attributed to water transfers from agricultural uses in the Imperial Valley to municipal uses in coastal southern California (Kjelland et al., 2019).

The Great Salt Lake: The Great Salt Lake is the largest lake in the Western United States, and the fifth largest terminal saline lake in the world after the Caspian Sea, Aral Sea, Lake Balkash and Lake Urmia (Belovsky et al., 2011; Baxter 2018). Water development and river diversions over more than a century and a half, have caused a persistent reduction in water supply to the lake, leading to a shrinking in the lake's area (Wurtsbaugh et al., 2016).

4.5 The role of Environmental Assessment (EA) in dam building

EA (EIA and SEA) are processes to consider environmental objections during the early phases of planning (see Chapter 3). EA shows promise in providing balanced solutions that addresses the goals of development and environment (Song et al., 2010).

4.5.1 The role of EIA in dam building

Various dams in the world are critically studied, in terms of creating environmental impacts. As mentioned, dams and reservoir projects affect that physical, biological and social environment including reduced sediment flow, eroded riverbeds and altered downstream flows (Kuenzer et al., 2012; Singer and Watanabe, 2014). Involuntary displacement and resettlement can be one of the most important social impacts of dam construction which risks loss of homes, land, livelihood, psychological marginalization and lost fragmented community ties (Cernea, 2007; Huang et al., 2018). EIA of reservoir construction offers a new perspective for development, and also provide opportunities for sustainable development in the watersheds (Tundisi et al., 2015). In principle, the

EIA should lead to the discarding of environmentally unacceptable actions and the mitigation – until an acceptable level is reached – of the environmental effects of proposed activities (Sadler, 1996, Wood, 2003; Erlewein, 2013). The implementation process of water resource developments projects with EIA can be defined in line with sustainable development objectives and lead to optimal utilization of water resources of a country with minimal environmental side effects in order to achieve the integrated management objectives of water resources (Mahmouei et al., 2017). ICOLD (2000) reported that a comprehensive EIA can helps planners in designing projects to reduce the negative impacts of dams to the environment and the society. Moncrieff, (2017) states a good dam's EIA fully considers the river basin's context, including socio-economic, cultural and biophysical aspects, it considers the project's effect on cumulative impacts from other dams, and how this relates to any thresholds limiting the river basin's carrying capacity. It also involves all project proponents, actors and affected groups and experts. Moreover, it sets out measures to reduce social and environmental impacts (e.g. the Guiding Principles on Sustainable Hydropower Development in the Danube Basin (ICPDR, 2013).

World Wide Fund reviewed some dams' EIA reports and stated that there are two main problems in the reports. One is the lack of basin-wide assessments of cumulative impacts where multiple dams are proposed and lack of transparency which is essential for public acceptance. Erlewein (2013) also studied the limits of EIA for hydropower dams in Himachal Pradesh, the "hydropower state of India", to explore to what extent India's current EIA system can appraise and reduce environmental impacts. He concluded that the current EIA system fails to address the cumulative effects of extensive dam building in the region and SEA could play a major role in covering the gaps regarding cumulative and basin effects. SEA and EIA are meant to complement each other (Fischer, 2007).

4.5.2 The role of SEA in dam building and water management

SEA can support strategic-level decisions at the policy, plan and programme levels, and can complement EIA at the project level (Ramos et al., 2015). Considering the environment at the basin level (SEA) is more important, because individual EIAs cannot sufficiently address the cumulative

impact on the whole basin. Moreover, the implementation of a SEA has the potential to strengthen EIA and to contribute towards the aims of sustainable development (Jay et al., 2007). For example, in the experience of South Korea, the SEA process led to the re-evaluation of management agencies' objectives and plans for dam construction, and to an integrated, comprehensive national dam construction plan (Song et al., 2010). It encouraged the inclusion of national environmental goals, policies and standards into the planning process, along with methods to maintain these standards. It also led to mitigation methods for environmental damage through the review and correspondence of international environmental agreements. At the regional level, SEA improved the evaluation of water supply alternatives and dam construction sites. A full range of water supply alternatives was considered, including the redevelopment of existing dams, desalination and underground dams. New dam construction was considered only when no other alternatives were feasible (Song et al., 2010).

Some SEAs have been carried out in some developing countries, including Pakistan, Nepal and India, with the help of the World Bank to ascertain the best options in water management without leaving a huge ecological footprint on water resources and associated biodiversity (Annandale and Hagler Bailly, 2014). Table 4.1 shows some example of SEA application in the water management sector in developing countries.

Table 4.1. SEA application in water sector in developing countries

SEA title	Year	Country	Sector	Type
Rajasthan Water Sector Restructuring Project	2000	India	Water	Sectoral EA
Tamil Nadu Water Resources Consolidation Project – Palar Basin	2004	India	Water	SBA
Uttar Pradesh Water Sector Restructuring Project – Ghagra-Gomti Basin	2009	India	Water	SBA
National Ganga River Basin Project SBA	2011	India	Water	SBA
National Ganga River Basin Project Strategic Environmental, Economic, and Social Assessment	2012	India	Water	Programmatic EIA
Water Sector Capacity Building and Advisory Services Project	2012	Pakistan	Water	Cumulative EA
Irrigation and Watershed Management Project	2006	Madagascar	Basin Management	Regional ESA
Eastern Nile First Joint Multipurpose Program	2009	Regional	Regional Basin management	Strategic Social and Environmental Assessment
Water and Sanitation Sector SEA	2001	Colombia		Sector SEA
Mekong Delta Water Management for Rural Development Project	2011	Vietnam	Water	Water management

Source: World Bank, 2012

4.6 Chapter summary

Irrigated agriculture uses the highest portion of the world's water resources. However, the agricultural water withdrawal varies from more than 80 percent in Africa and Asia to just over 20 percent in Europe. This water withdrawal has led to water shortages, especially in semi-arid and arid region across the world. Lake desiccation is another serious impact of increased water use by humans, especially for agricultural irrigation. EA, in the form of both SEA and EIA, are processes to support considering environmental objections during the early phases of planning and find balanced solutions that address the goals of development and environmental impacts. While this chapter provided an overview of water use around the world, the next chapter explains how water management works in Iran and also introduces the study area (ULB) and the case studies.

5 Literature on water management in Iran: Case study context

The purpose of this chapter is to establish how water management works in Iran. In doing so, the chapter is sub-divided into four main sections. The first section summarises the water sector in Iran, followed by an introduction of the Urmia Lake Basin (ULB) and why this region has been chosen as a case study area. Third section introduces three dams which have been selected as multiple case studies in this research and the last section provides a summary.

5.1 Water in Iran

Iran is facing unprecedented water management challenges, which have turned water security into a national priority (Collins, 2017; Madani, 2014). Drying lakes and rivers, declining groundwater levels, land subsidence, deteriorating water quality, desertification and dust storms are the modern problems of a nation, which was once recognised as the pioneer of sustainable water management for thousands of years (Madani et al., 2016). Madani (2014) has identified the main drivers of Iran's water problems as being rapid population growth, inefficient agriculture, and mismanagement.

5.1.1 Water use in different sectors

Iran is located in one of the driest areas of the world where water scarcity is a major constraint on agricultural production. Mesgaran et al. (2016) have classified 98% of Iran as hyper arid, arid, and semiarid based on an aridity index (Figure 5.1). The mean annual precipitation is below 250mm in about 70% of the country, and only 3% of Iran's land area receives above 500mm per annum of precipitation. Due to its location in a dry climatic zone, Iran is currently experiencing unprecedented water problems which adversely affect parts of the country, ecosystem, economy and the lives of many people (Madani et al., 2016; Madani, 2014).

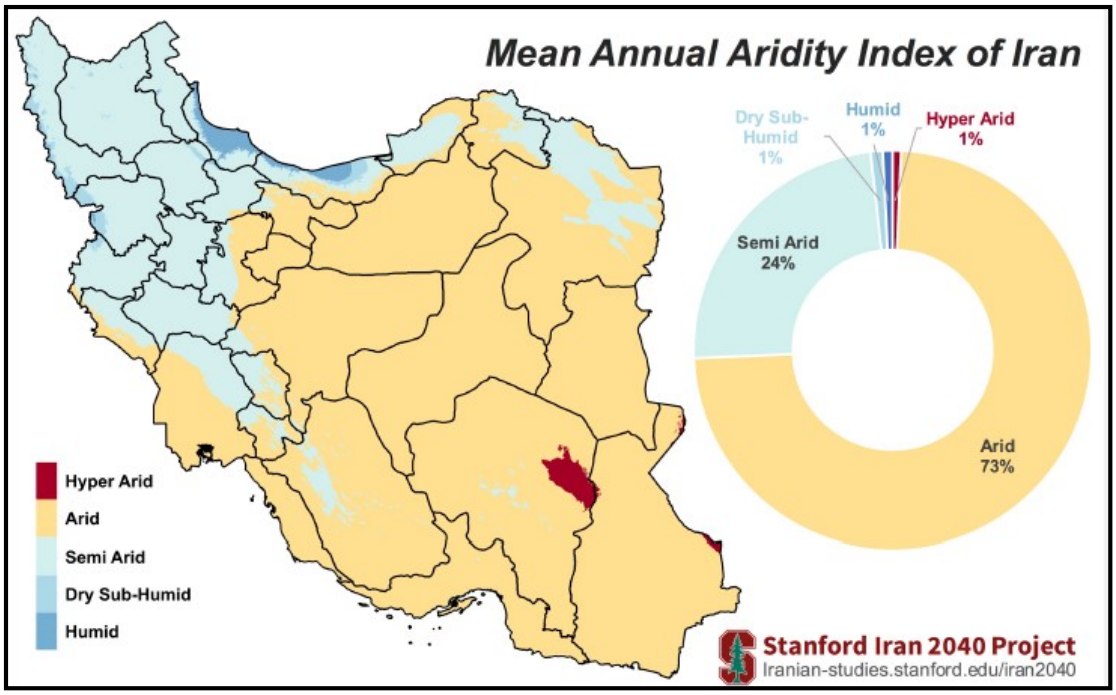

Figure 5.1. Mean Annual Aridity (mm) in Iran

Source: Mesgaran et al., 2016

World Bank (2014) data in Figure 5.2 shows that 92.18% of water withdrawal in Iran is consumed by the agricultural sector. However, based on table 5.1 agriculture only contributes 9.1% of the Gross Domestic Product (GDP) and provides 18% of the total employment; whilst supplying about 90% of the domestic food demand (Mesgaran et al., 2016). This contribution to GDP has even decreased over time (Madani et al., 2016). One reason that Iran has overlooked the economic efficiency of its agricultural sector may be due to having oil-based economy. Therefore, this sector is not yet industrialised and is suffering from outdated farming technologies and practices leading to very low efficiency in production (Madani et al., 2016). A comparison in Table 5.2 shows that developed countries consume most water in industrial activities, in contrast to the huge amount of water is used by Iranian agriculture.

Table 5.1. Iran GDP by Sector (2016)

Service	Industry	Agriculture
51%	39.9%	9.1%

Source: Salehirad et al. (2017)

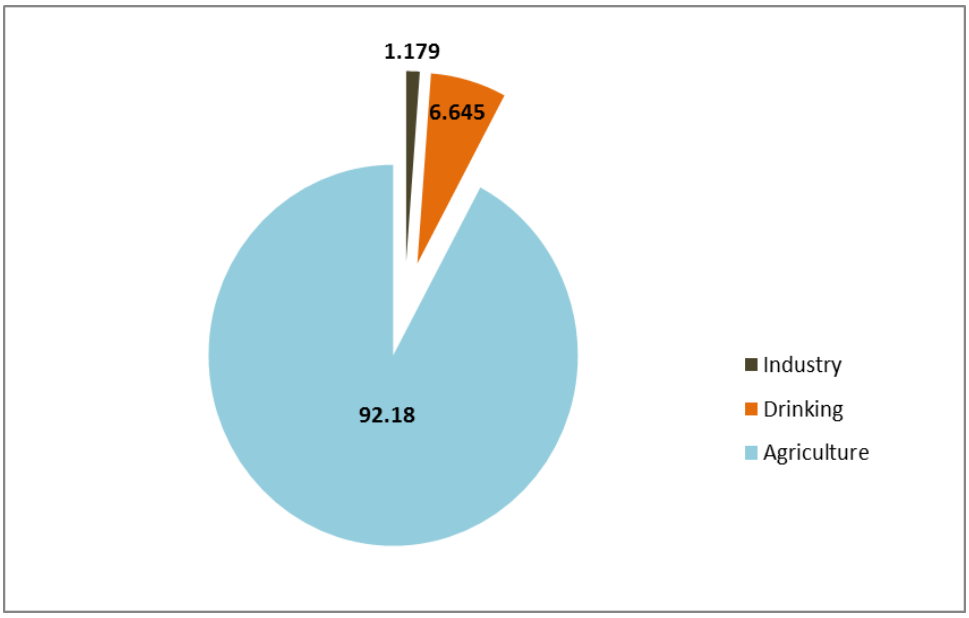

Figure 5.2. Total freshwater withdrawal % by sector in 2014

Source: World Bank, 2014

Table 5.2. share of water uses in different sectors

Uses	Worldwide (%)	OECD (%)	Iran (%)
Domestic	8	5	6
Industry	23	65	1
Agriculture	69	35	93

Source: Sadegi (2010), Omrani (2013)

5.1.2 Administrative organisation for water management in Iran

Water resource planning and management are the sole responsibility of the Ministry of Energy (MoE), which uses the 1982 Fair Water Distribution (FWD) Act to manage water resources. The administrative structure of the Iranian MoE has two main levels of decision-making:

- **Policy level:** This level is administered by the Deputy of Water Resources and Water and Wastewater (WRWW). The MoE has 6 deputies responsible for 6 Directorates including the Office of Macro Planning for WRWW which has a Water Resources Group responsible for river basin planning. The implementation of polices are administered by Iran Water Resources

Management Company (IWRMC); which has a Water Planning Bureau that deals with water allocation applications.

- **Regional level**: Regional Water Companies (RWCs) are the executive arm of the IWRMC.

5.1.3 Key players in Iran Water Sector

According to Iranian law, the following ministries are directly responsible for development and assessment of water resources:

- **The MoE:** The MoE is responsible for energy supplies and water resources. Within the MoE, the Water Affairs Deputy is responsible for the planning, development, management, control and conservation of water resources. The Water Affairs Deputy consists of the following sections: the Iran Water Resources Management Company (IWRMC), Provincial Water Authorities, Irrigation, and Drainage Operation and Maintenance Companies. IWRMC has a Water Planning Bureau which has a technical Committee dealing with water allocation applications (Hashemi, 2012).
- **The Ministry of Agriculture (MoA)**: The MoA is a major player in the planning process due to the sector's water consumption and is responsible for managing the agricultural water sector, irrigation and drainage networks (Hashemi, 2012). While the MoA is appointed to distribute water for agriculture among farmers and collect the water fees, water and wastewater companies are responsible for the distribution of water for domestic use in urban and rural areas and for collecting water fees.
- **The DoE**: The DoE is responsible for the preparation of the environmental protection policy and the laws. The EIA Bureau in DoE is responsible for reviewing of EIA reports, deciding on the acceptability of EIA reports, and issuing EIA approval (Khosravi et al., 2019a).

5.1.4 Ground water in Iran

Iran is currently among the top groundwater miners in the world (Döll et al., 2014; Gleeson et al., 2012, Madani, 2014). More than 55 percent of the total water demand in Iran is supplied through groundwater pumping to compensate for surface water deficiency (Madani et al., 2016). Groundwater resources are mainly controlled by private landowners of wells and qanats. In theory, wells need to have permits, although in practice unpermitted wells are ubiquitous. Therefore, when wells run dry due to lower groundwater levels, farmers dig deeper wells and buy pumps with higher lifting capacities. This aggressive groundwater withdrawal has resulted in groundwater table decline. Consequently, nearly 50 percent of the plains across Iran are in a critical condition because of unsustainable groundwater extraction (Madani et al., 2016).

5.1.5 Surface water in Iran

Iran, with 1,648,195 km^2 area and 80 million inhabitants, has just an average annual precipitation of about 250 mm. This means the country desperately needs to save water. The only response to this demand in recent decades has been the construction of dams. Iran ranks third in the world in dam building after China and Japan (Rubin, 2013; Madani, 2014; Madani et al., 2016) and second with respect to construction of large dams after China (Figure 5.3).

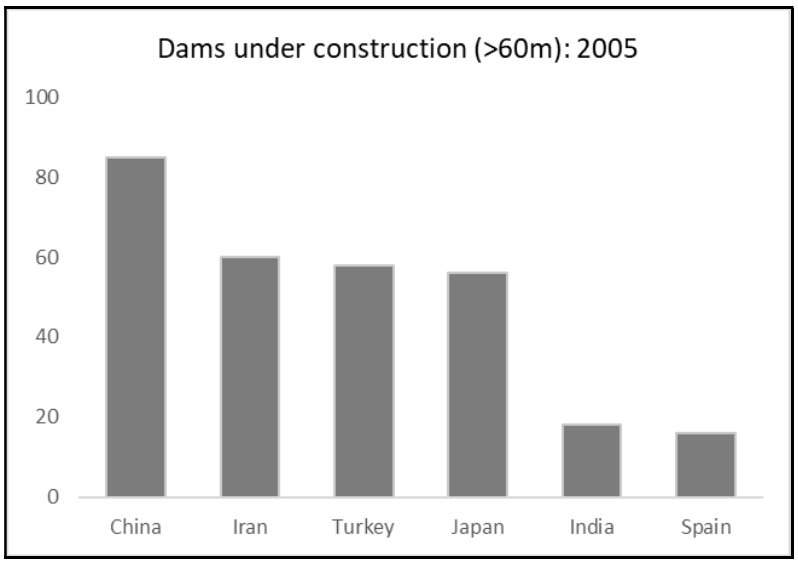

Figure 5.3. The World's largest dam building nations

(Adapted from International Journal on Hydropower and Dams, 2005)

The massive reconstruction programme started with the 1st NDP (1989-1993), which was characterised by many development projects that were difficult to manage due to the lack of integrated river basin management. Consequently, there were fewer completed works than in the 2nd, 3rd and 4th NDPs. Table 5.3 represents the pressures exerted by the short-term development plans.

Table 5.3. Water resources development (dams and irrigated area) 1948-2010

Development Plan Periods	No of dams	Regulated Volume MCM	Irrigated land (ha)
Pahlavi Era (Before Revolution)			
Pre-development planning	24	12	190
1st NDP: 1948-1954	1	0	0
2st NDP: 1955-1962	5	5915	307,240
3st NDP: 1963-1976	4	307	31,800
4st NDP: 1968-1973	7	3587	379,371
5st NDP: 1974-1979	4	4370	140,872
Subtotal Pahlavi era	45	14,191	859,483
Dawn of Islamic Republic in 1979 (After Revolution)			
Iran-Iraq war: 1980-1988	113	1486	168,162
1st NDP: 1989-1993	75	762	56,833
2st NDP: 1994- 1999	157	2007	203,289
3st NDP: 2000- 2004	126	7492	571,436
4st NDP: 2005- 2010	72	4690	320,033
Subtotal until 2010	548	16,437	1,319,753
Total	588	30,625	2,179,236

Source: MoE (2009/2011), Hashemi (2012)

5.2 Case study area: Urmia Lake Basin

Urmia Lake is in the north west of Iran between the West Azerbaijan (WA) and East Azerbaijan (EA) provinces (Figure 5.4). A unique feature of this UNESCO designated Biosphere Reserve and National Park is its hypersaline environment, with salinity ranging from 217 to 300 g/l, approximately eight times higher than sea water (UNEP, 2012; Ghaheri et al., 1999; Ahmadzadeh Kokya et al., 2011; AghaKouchak et al., 2015). The water surface area of Urmia Lake has been shrinking for the last 3 decades (Govarchin Ghale et al., 2018). As a result, more than 80% of the water surface area of this

unique hypersaline lake has changed into a solid saline body (AghaKouchak et al. 2015; Govarchin Ghale et al., 2018). The mean water level fluctuated between 1271-1278m above sea level, and in recent years it has reduced by more than 6 meters (Merufinia et al., 2014). Since the lake is shallow (Djamali et al., 2008), the surface area of the lake has also shrunk rapidly (Shadkam, 2017). Due to the acute water management challenges faced by this area, this research has chosen the Urmia Lake Basin (ULB) to explore water management and its associated problems in Iran.

ULB is an area of around 51,000 km^2, of which the Lake itself formerly covered approximately 5000 km^2. Seven million people live in these provinces and Urmia Lake plays a crucial role in people's lives and the economy of the region (UNEP, 2012; Govarchin Ghale et al., 2018). The population density around Urmia Lake, however, is much higher than around the Aral Sea, resulting in higher risk (UNEP, 2012; Shadkam, 2015). As discussed in Section 1.1.3, severely desiccated saline lakes become sources of fine dust that harm human health and agriculture (Griffin 2004; Micklin 2007), as has been well documented in the case of the Aral Sea, where 12,700 km2 of lakebed has been affected by agricultural water withdrawals (Crighton et al. 2011; Indoitu et al., 2015; Wurtsbaugh et al., 2017).

Water authorities prefer to blame climate change as a reason for the deterioration of lakes. For example, managers of Great Salt Lake and Oregon's Lake Abert previously blamed declining water levels in lake only on natural precipitation cycles, without a direct analysis of the cause. However, analysis shows that water diversions was the main reason of the long-term decline of the lakes (Wurtsbaugh et al., 2017). Climate change has also been blamed by Iranian water authority as one of the main causes of the Urmia Lake's shrinkage (AghaKouchak et al., 2015). However, there are a number of studies to quantify the factors that contribute to drying Urmia Lake which have proved that anthropogenic activity has been the main primary reason. Hassanzadeh et al. (2012) used a system dynamic model to determine the lake's level and to analyse the role of climate change, construction of four dams and precipitation and inflow changes of Urmia Lake. The study concluded that precipitation, construction of four dams, and overuse of surface water resources and climate

change have 10%, 25% and 65% effects on the decline of water level of Urmia Lake, respectively. However, Govarchin Ghale et al. (2018) indicated that anthropogenic influence and climate change have roughly contributed to 80% and 20% of the effects on Urmia Lake shrinkage in period 1998–2010, respectively. The main anthropogenic factor is withdrawal of water by dams and wells and this is discussed in the following section.

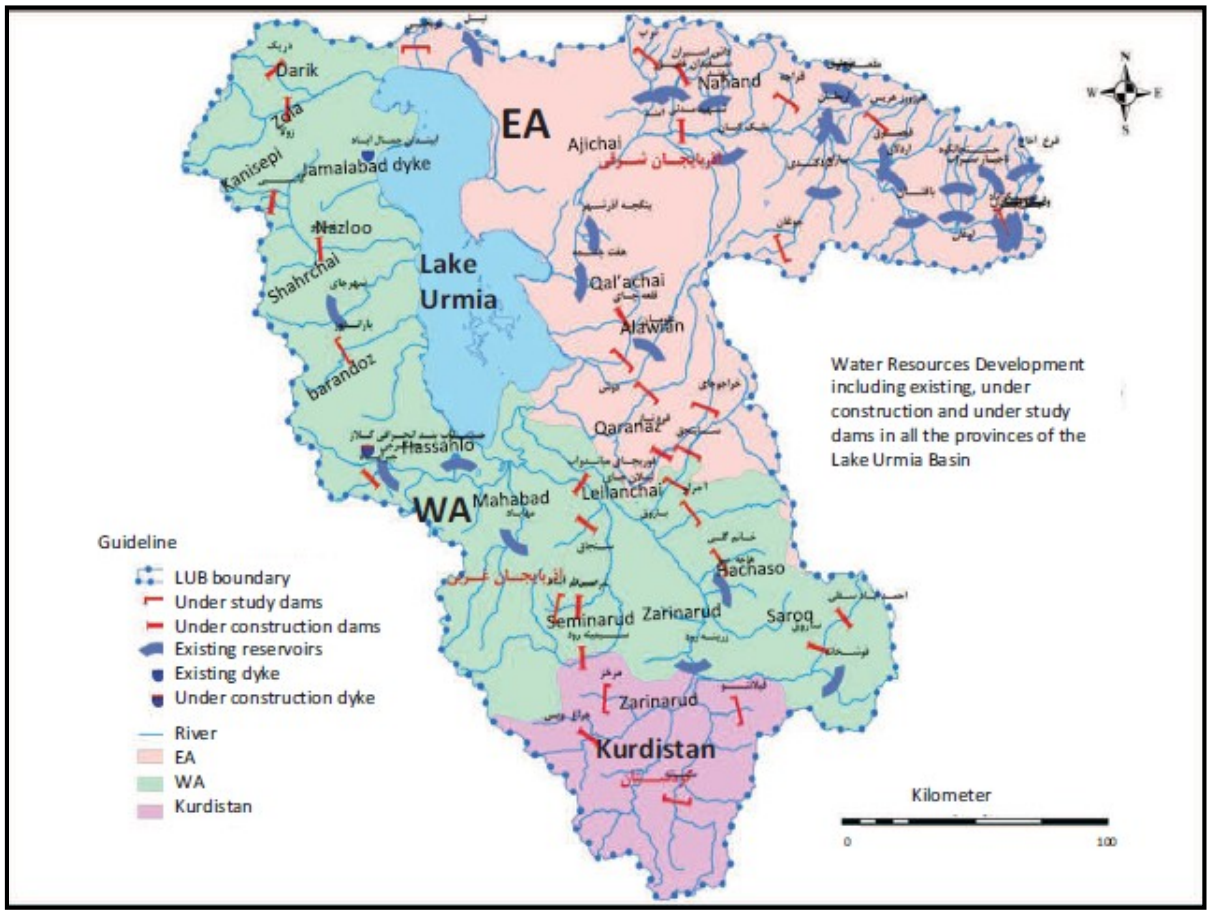

Figure 5.4. Map of ULB showing the political boundaries of the provinces situated within ULB

Source: (ULRP, 2015)

Figure 5.5. Image of change of lake into saline body

Source: Khosravi, April 2018

Figure 5.6. Urmia Lake salt is refined and sold in a store on the causeway

Source: Khosravi, April 2018

5.2.1 ULB and water withdrawal

5.2.1.1 Ground water withdrawal by wells

There are 88,707 wells in the basin of which 50% are illegal (Table 5.4). Water extraction from ground water is about 1920 Mm^3 (million cubic meters) per annum (ULRP, 2016a). Groundwater resources in Iran and the LUB are mainly controlled by private landowners of wells, and there is no policing mechanism for the implementation of groundwater allocations. The Fair Water Distribution Act (1982) was an attempt to control groundwater resources. Initially, private individuals and companies were offered a Water Allocation Permit without any strict criteria to encourage owners to register their share. However, the wells did not have volumetric devices to monitor the implementation of the Water Allocation Permits which are oversubscribed (Hashemi, 2012).

Table 5.4. Status of wells in ULB

Wells permit	Number	Discharge volume (Mm^3)
With operational permit	32,417	1142
Without operational permit	56,290	778
Total	**88,707**	**1920**

Source: ULRP, 2016a

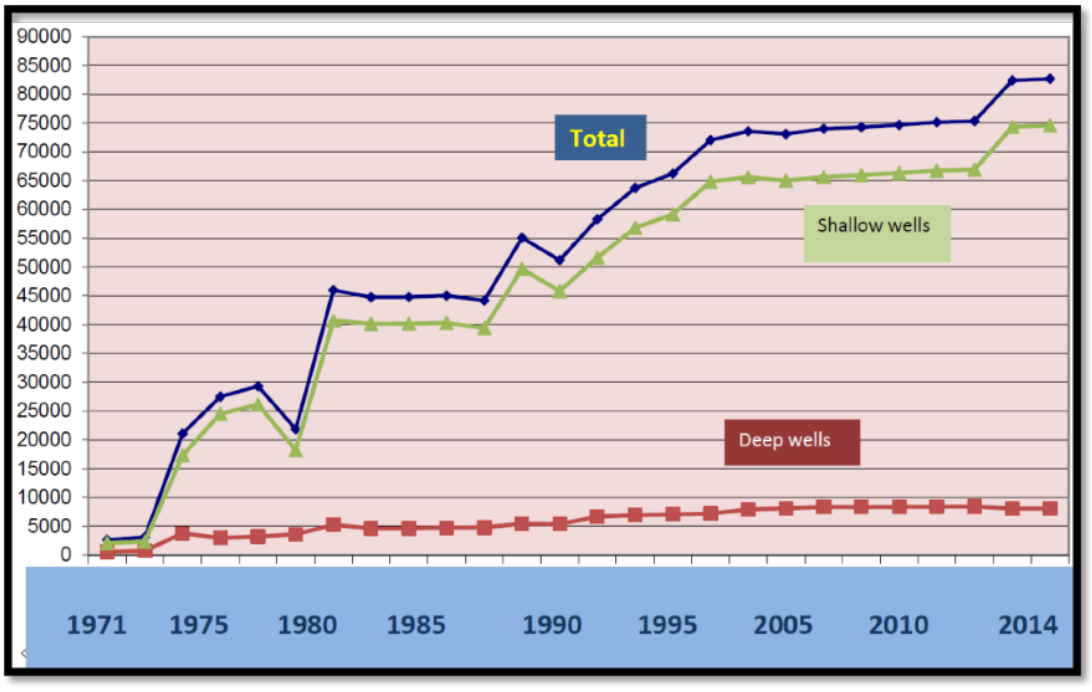

Figure 5.7. Trend of number of the wells in Urmia Basin (ULRP, 2015)

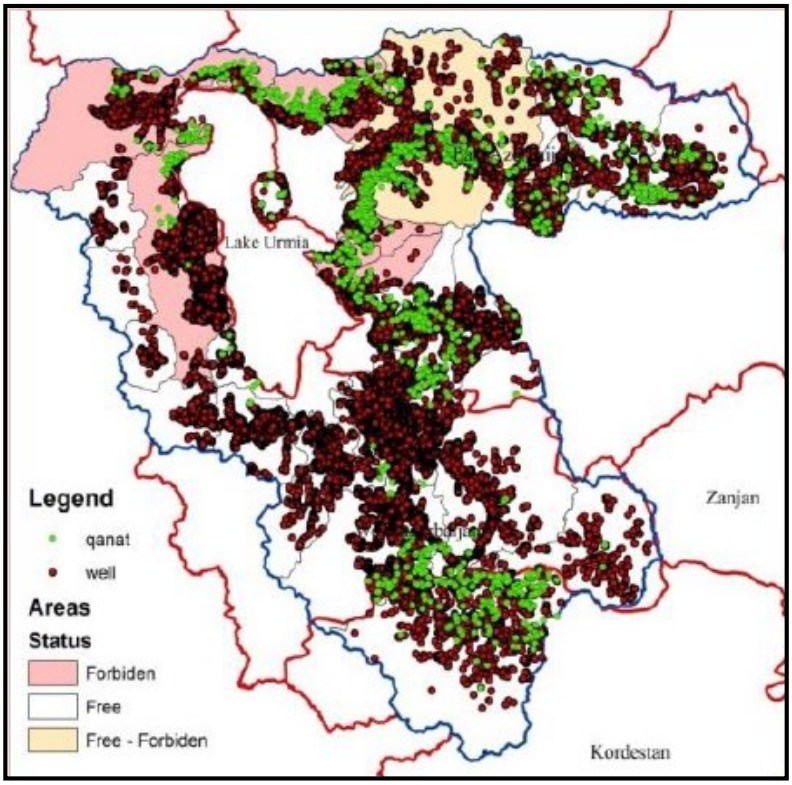

Figure 5.8. Groundwater withdrawals in Urmia Basin (ULRP, 2016a)

Unauthorised abstraction of water from the surface through direct pumping is another form of water extraction which has been mentioned in some literature and observed during a visit to the ULB by the author (Figure 5.9).

Figure 5.9. Unauthorised surface water withdrawals in ULB (ULRP, 2016a)

5.2.1.2 Dams

According to ULRP (2016a) there are 53 operational dams in ULB, 9 are under construction, and 27 are under design study. However, the ULRP has prevented any new dam and development project in the basin. The sum of the adjustable annual water basin of the lake is 1600 Mm^3. It seems that the amount of well's water extraction is close to operational dam extraction water annually. Table 5.5 shows the number of dams of the ULB.

Table 5.5. Status of Dams in ULB

-	Number	Capacity (Mm^3)	Adjustable water (Mm^3)
Operational	53	1738	1600
Under construction	9	1231	1369
Under design study	27	521	460
Total	**89**	**3420**	**3429**

Source: ULRP, 2016a

As Figure 5.10 illustrates, the first major dam came into operation in the ULB in 1970. Mahabad Dam with a capacity of 197 Mm^3 is situated in Qazi Muhammad city. Bookan Dam with a capacity of 600 Mm^3 was operational in 1971. Forty years later, there are 53 dams in operation in the ULB. The political instability was heightened by the imposed war (1980-88). During this period, no National Development Plan (NDP) were employed and agriculture development was hindered (MoE, 2003; Hashemi, 2012). Thereafter, a massive reconstruction programme started with the 1st post-Revolution NDP (1989-1993), which was characterised by the number of developments which were difficult to manage due to the lack of integrated approach to river basin management.

According to the International Commission on Large Dams definition (see Section 4.3), 19 of the operational dams in the ULB can be classified as large dams with more than 3 Mm^3 capacity (Figure 5.11).

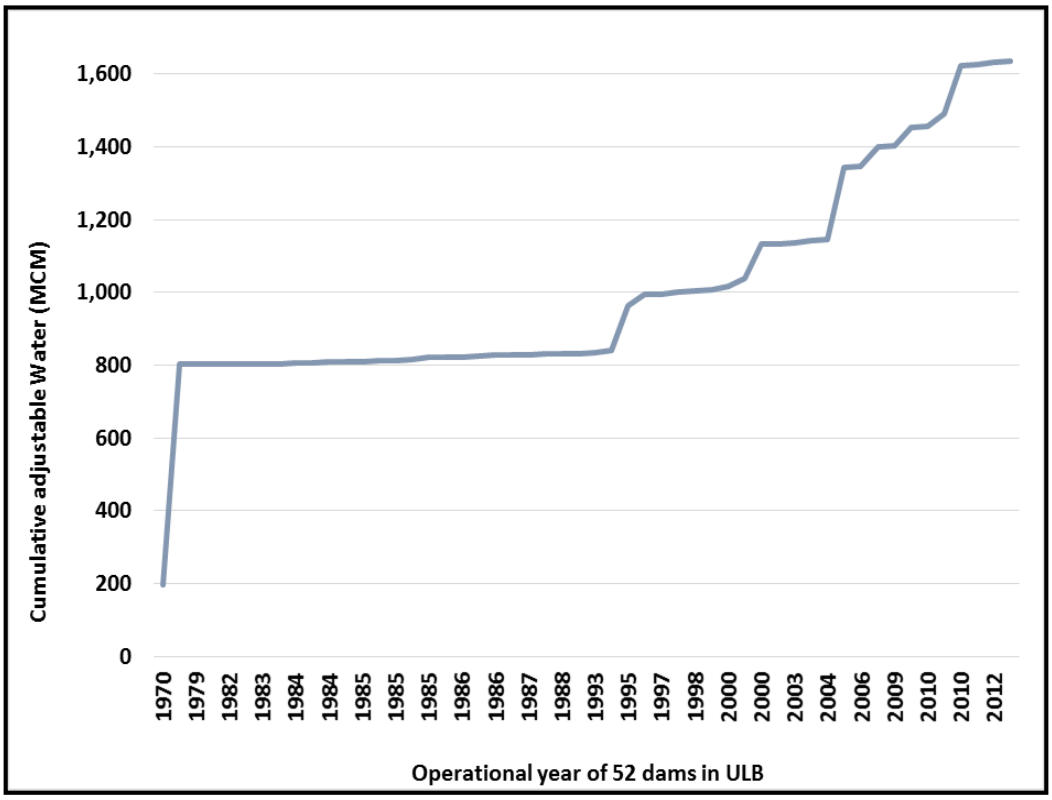

Figure 5.10. Operational year of 53 dams in ULB and their cumulative adjustable water

Source: Khosravi

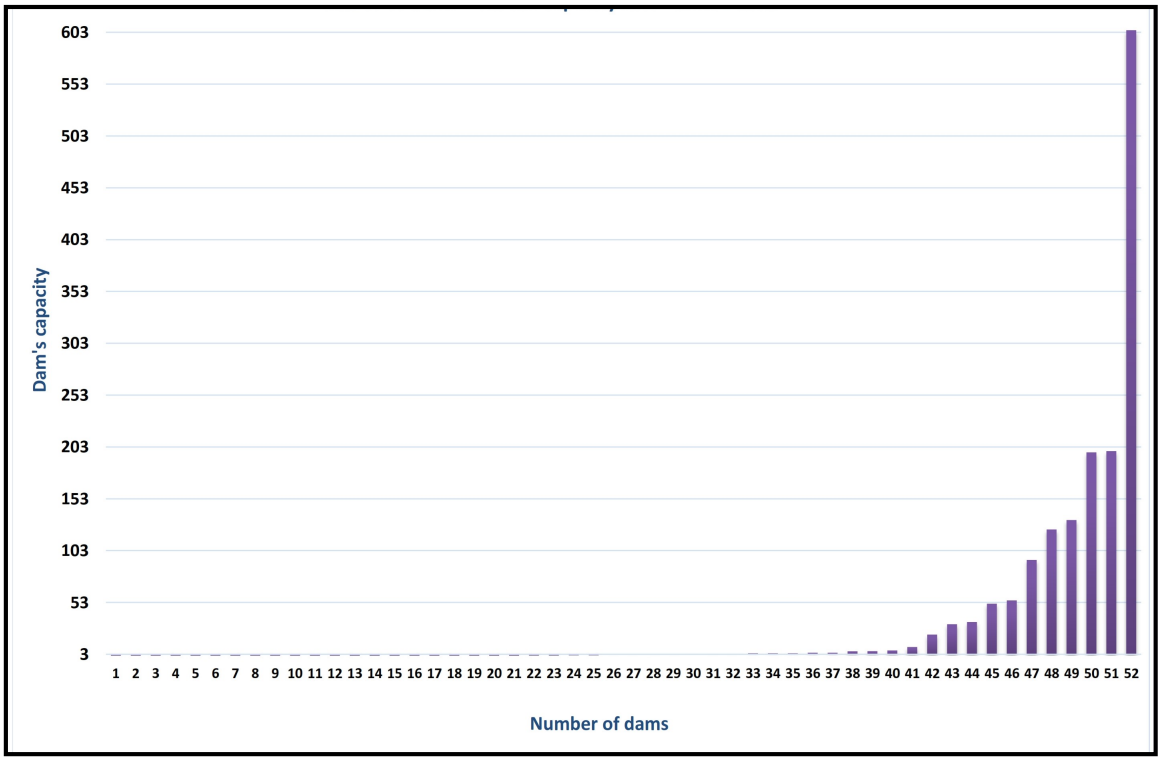

Figure 5.11. Number of dams with the capacity more than 3 Mm^3

Source: Khosravi

The sum of the adjustable annual water of operational dams in ULB is 1600 Mm^3, and 82.5% of water is exploited by West Azerbaijan province (Table 5.6).

Table 5.6. Status of surface water stakeholders in ULB

Province	Developer	No of dams	No of large dams	Adjustable water (Mm^3)	Percentage of Adjustable water
West Azarbayjan	WC	15	8	1320	82.5
	MoA	-	-		0
East Azarbayjan	WC	20	9	240	15
	MoA	18	5	40.2	2.5
Sum		**53**	**21**	**1600.2**	**100**

Source: ULRP, 2016a

5.2.2 Agriculture in ULB

Agriculture can be considered as the primary water imbalance driver in the ULB (Faramarzi, 2012). The basin has an arid to semi-arid climate and its agriculture is highly dependent on irrigation (Shadkam, 2017). The area under irrigation around the lake has increased over seven times during the last 15 years (Iran Ministry of Energy, 2014; Shadkam, 2017) and is illustrated in Figure 5.12. There are now about 510,000 ha of irrigated lands in the basin with 33 modern and traditional irrigation networks. The reported irrigation efficiency is quite low (Iran Ministry of Energy, 2014; Shadkam, 2017). These land cover changes, along with climate change, have put extra pressure on the basin's water resources and caused a dramatic decline in the inflow into the lake (Hashemi, 2012; Shadkam, 2017).

To save water for the environment, measures for saving agricultural water have been introduced as an agenda for environmental policy in many arid and semi-arid regions (Shadkam, 2017; Ahmadaali et al., 2018). Törnqvist and Jarsjö (2012) investigated the hydrological effects of improving irrigation technologies on vast cotton fields in the Aral Sea basin located in Central Asia. The results showed that the implementation of irrigation technologies will lead to water savings and will increase the discharge to the Aral Sea between 1 and 6 km^3 per year (Ahmadaali et al., 2018).

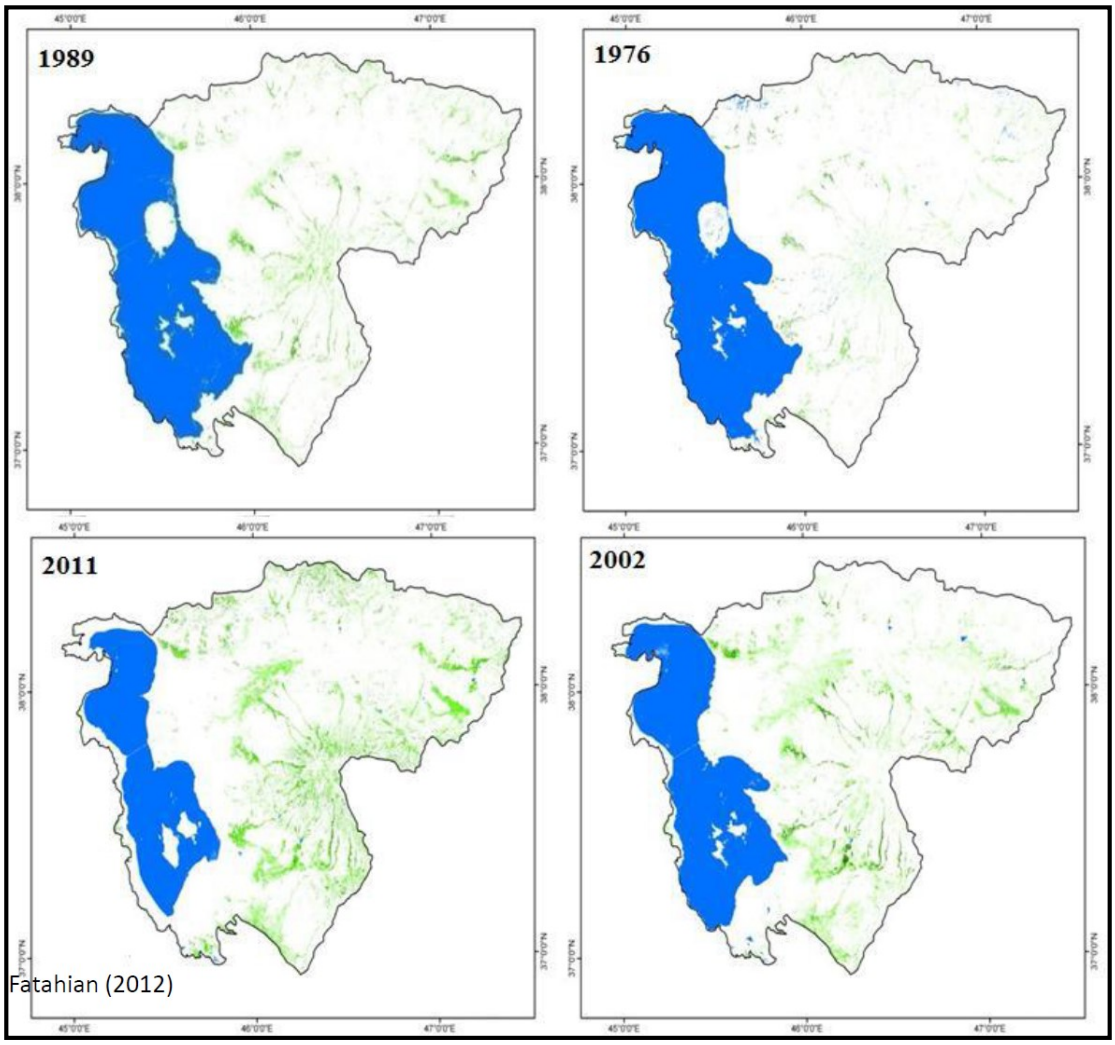

Figure 5.12. Irrigated Area Changes during 1976- 2011

Source: Lotfi, 2012

5.2.3 Main stakeholders in ULB

Several stakeholders are involved in the management of the lake. The most influential of these are the decision-making organisations which are government or affiliated with the government (Lotfi, 2012). As Table 5.6 shows Water Companies (WCs) are the main stakeholders in ULB water who are the executive arm of the MoE. The MoA is also a major player in the planning process as 92% of the water is used for agriculture and the MoA is responsible for managing the agricultural water sector and irrigation and drainage networks. The DoE is another government stakeholder, and their role has become more important since the introduction of the 1996 EIA Act which requires EIA for all major projects.

The stakeholder groups also include people directly using the Lake and surrounding lake, such as Artemia and salt harvesters. It also includes people living and working in the surrounding towns and villages throughout the Basin (Lotfi, 2012). Some stakeholder groups are based outside the Basin, such as Ministries in Tehran, and International stakeholders including organisations related to environment and wetland conservation. NGOs and local communities have no input into the top-down policymaking and planning process.

5.2.4 Urmia Lake Restoration Plan (2013- 2023)

Due to the deteriorating condition of Urmia Lake, the Iranian government announced a national plan called the "Urmia Lake Restoration Plan" (ULRP) in July 2013 and later approved a budget of 5 billion dollars (US) for implementation of this plan (Guardian, 2015; Shadkam, 2017). This ULRP was approved as a ten-year plan and uses six categories of 27 measures (ULRP, 2016b; Shadkam, 2017). These are as follows:

I. Control and reduction of water depletion in the agricultural sector

3. Reduction of 40% allocated ground and surface water to the farmers through direct purchasing system by the MoE in a five-year period.
4. Planning for enhancing the productivity of 60% with less amount water used in the agriculture sector by Ministry of Agriculture.
5. Allocating funds and supplying required technologies by the government to increase the efficiency of remaining water usage.

II. Control and reduction withdrawal of surface and groundwater resources in ULB

6. Prevention of increasing water depletion and new projects development, especially in the agricultural sector (no new water allocations).
7. Prevention of unauthorised surface water withdrawal.
8. No new dam construction projects, no new irrigation and water supply network in ULB.

9. Improvement the current conditions of wells in ULB throughout installation of smart water volume counter to record and monitor withdrawal amount (To increase the river flow recharge to the lake).
10. Perform the coordination with the judiciary to facilitate and accelerate the implementation of the law for illegal wells, particularly wells affecting surface water condition.

III. Initiatives on Protection and mitigation of negative impacts

11. Identification of dust source and stabilizing them.
12. Study and implementation of ecological protection program in Urmia National Park following environmental concerns.
13. Identifying effective factors on feeding major rivers leading to the lake through watershed management to increase recharge rate from rivers to the lake.
14. Establishment of Urmia Lake Research Centre by the DoE.
15. Finding out the vulnerability of health, hygienic, social and environmental problems caused by Urmia Lake dry up, preparation and implementation of prevention programs reducing and preventing the likelihood of risk effects.
16. Preparation of productive programs increasing alternative employment and livelihood by relevant organisation.

IV. Studies and software measures

17. Development and implementation of training program, capacity building, awareness, and getting local community participation to illustrate the consequences of current critical situation and the necessity of reviving Urmia Lake.
18. Conducting cadastral survey for ULB Lands.
19. Design and implementation of a comprehensive decision support system in ULB.
20. Evaluation of Shahid Kalantary causeway effects on Urmia Lake ecosystem and providing constructive solutions.
21. The feasibility study on Urmia Lake salt industrial utilisation considering environment aspects.

22. Feasibility study on new technologies application for the sake of Urmia Lake rescue.

V. Facilitate and increase the water volume entering to the Lake through structural measures

23. Water transfer from rivers to the lake.
24. Water transfer from Hasanloo Dam to islands located in borders of Urmia Lake and opening the path of waterways feeding southern wetlands.

VI. Water Supply from new water resources

25. Appropriation of required funds and accelerate transferring water from Zab River to ULB and priority in implementing of the Silveh water transfer project (see Table 5.7).
26. Transfer of ULB treated wastewater into the Urmia Lake.
27. Study of water transfer project from Caspian Sea to the Urmia Lake

Table 5.7. Water Supply Potential for Urmia Lake during ULRP

Water Source	**Description**		**Annual volume of water transfer to lake (Mm3)**
Current Volume of Water Transfer to the Lake from Rivers	Net water inflow volume to the lake's water body		1500
Water Resources Outside Basin	Water Resources Outside Basin		600
	Water Transfer Project from Lavin River (Silveh Dam)		5th 190 3th 90
Water Resources Outside Basin	Basin Seepage		300
Reducing the Water Consumption in Agricultural Sector	Savings in Agricultural Water Use (40%)	From Surface Water Resources	970
		From Ground Water resources	370
	Releasing Water Storage of Dams		Year One: 150 Year Two: 200 Year Three: 250
Reducing the Water Loss in the Lake's Buffer Zone	Water Transfer to Lake's Body of Water		250

Source: ULRP, 2016a

5.3 Case studies context

As explained in case selection section (see section 2.3.1), there are 53 operational dams in the ULB, 24 out of which were exempted from obligatory EIA, based on Iranian screening thresholds. This left a total of 19 dams which required EIA. In selecting the case studies out of the 19 dams, only three dam projects were identified for which EIA reports were prepared in the ULB. These three case studies are introduced in this section.

5.3.1 Zola Dam

Zola Dam is located in the ULB and West-Azerbaijan province of Iran. The dam has a height of 83m with an average capacity of 85 million cubic metre (Mm^3) of water and an average annual discharge of 162 Mm^3. It is an Earth-rock dam with a central clay core. The dam's construction started in 2001 and it has been in operation since 2010. When proposed, the dam project fell under the threshold of the Iranian screening EIA regulations and an EIA report was therefore prepared to comply with EIA regulations. The EIA was approved by the EIA Committee in 2006 on the basis of certain terms and conditions. Regardless of EIA quality, the most controversial aspect of Zola's EIA was its late start while the dam was already under construction.

The list of conditions in Zola's EIA approval are as follows:

1. The water authority is committed to allocate the environmental water right of lake which is 30 Mm^3/year.
2. The water authority is committed to submit and implement an Environmental Management Plan (EMP) for constructional and operational phases.
3. The water authority is committed to provide an online monitoring system.
4. The Water Authority is committed to provide a Health, Safety and the Environment (HSE) team to manage the monitoring and all conditions of EIA approval during construction and operational phases.
5. The water authority is committed to submit a monitoring report every three months to the provincial EIA office.

An image of Zola Dam appears in Figure 5.13.

Figure 5.13. Zola Dam

Source: Khosravi, April 2018

5.3.2 Barandoz Dam

Barandoz Dam is located in the ULB and West-Azerbaijan province. The dam wall is 63 metres high above the rock foundation and holds 84 Mm^3 of water with an average annual discharge of 147 Mm^3. Construction started in 2010 and reached 40% completion. However, it will not be allowed to operate due to the ULRP strategies which banned any new dam construction and operation in ULB. Barandoz' EIA report was approved in 2009 with the following terms and conditions:

1. Comply with water, air, soil and waste standards during construction and operational phases.
2. The MoE is committed to allocate the river's environmental water requirement.
3. Providing an online monitoring system.
4. The water authority is committed to provide a HSE team to manage monitoring and the terms and conditions of EIA during construction and operational phases.
5. The water authority is committed to implement the Environmental Management Plan according to the EIA report.

6. Inspect compliance with EIA's terms and conditions with the help of a consultant and send the inspection reports to the EIA Bureau.

5.3.3 Kani Sib Dam

Kani Sib is located in West-Azerbaijan province and in the Zab River Basin. This dam is part of a larger complex that is designed to transfer water from the Zab Basin to Urmia Lake. Transferring water to ULB is one of the Urmia Lake Restoration Plan's objectives (see section 5.2.4) and has become a very controversial issue in Iran. Kani Sib Dam was constructed on the Glass River with reservoir capacity of 327 Mm^3, and the estimated water to be transferred from Kani Sib Dam to the Lake was about 640 Mm^3 per annum. The project contract was awarded to Maroon Engineering Company in 2016 and the dam is now under construction without EIA approval. Kani Sib is an example of dam construction that commenced prior to EIA approval due to political pressure. The proposed water transfer development from Zab Basin to Urmia Lake can be classified into four components:

- Kani Sib dam with 327 Mm^3 capacity,
- Badin Abad concrete diversion dam,
- A water canal 6 km in length,
- A sediment collector dam of soil-cement type, with 12 m height and related access roads.

5.4 Chapter summary

Iran ranks third in the world with regards to dam construction after China and Japan (Madani, 2014; Madani et al., 2016). The ULB was chosen as the study area as it shows typically aggressive dam construction in Iran and EIA studies have been clearly overlooked by environment and water authorities in ULB. As explained three dam projects out of 53 dams had EIA reports in the ULB and only one of these had EIA approval. The three projects with the EIA reports were subsequently used as case studies and introduced in this chapter. In the next two chapters the Iranian EIA system is reviewed based on the criteria framework developed and the reasons which lead to the large number of projects proceeding without EIA approval are explored.

6 EIA in Iran: A Literature Review

The purpose of this chapter is to provide literature about EIA in Iran. In doing this, the chapter is sub-divided into five sections. The first section introduces Iran briefly, followed by identifying the legal basis of environment and EIA in Iran. The third section reviews the EIA system in Iran based on existing literature. This is followed by an introduction of the country's EIA legislation within the water sector and the last section provides a summary.

6.1 Introduction to Iran

The political system in the Islamic Republic of Iran is a unique and complex blend of theocratic and democratic government. Iran is the only Shia country in the Muslim world that has formulated its legal framework in accordance with Shia traditions. The 1979 Revolution changed the regime and established a government structure based on Islamic law. Following the Revolution, a constitution was written to reflect these concepts and Iran's current political system and government structure was accordingly established (Jones, 2009).

Geographically, Iran is divided into 33 provinces (Figure 6.1) which are administered by central government (Hashemi, 2012). The country can be considered a centralised country based on the distribution of its administrative functions, (Dienel et al., 2017).

Demographically, the latest Iranian census conducted in 2016 puts Iran's population at 80 million people. The census shows that the annual population growth rate of the country has dropped to 1.24%, a rate similar to today's world average but significantly lower than its peak a few decades earlier (Statistical Centre of Iran, 2017; Roudi et al., 2017).

Figure 6.1. Provinces of Iran

6.2 Environmental protection in Iran

Sixty countries have mentioned environment in their constitution and Iran is one of them (Taghvaee et al., 2015). Article 50 of Iran's Constitution is the highest-ranking legal reference addressing environmental conservation (Yousefi et al., 2015) and environmental protection is therefore embedded in the constitution. This Article states that:

"*The preservation of the environment, in which present and future generations have a right to flourishing social existence, is regarded as a public duty in Iran. Economic and other activities that involve pollution of the environment or cause irreparable damage to it, are forbidden*" (Taghvaee et al., 2015).

Generally, environmental laws stem from different levels of Iranian legislation (Figure 6.2) (UNDP, 2004):

- Type-1: Environment in Iran's Constitution
- Type-2: Environmental laws passed through the parliament,

- Type-3: Environmental laws in National Development Plans (NDP)
- Type-4: Environmental bylaws enacted by the Cabinet of Ministers.

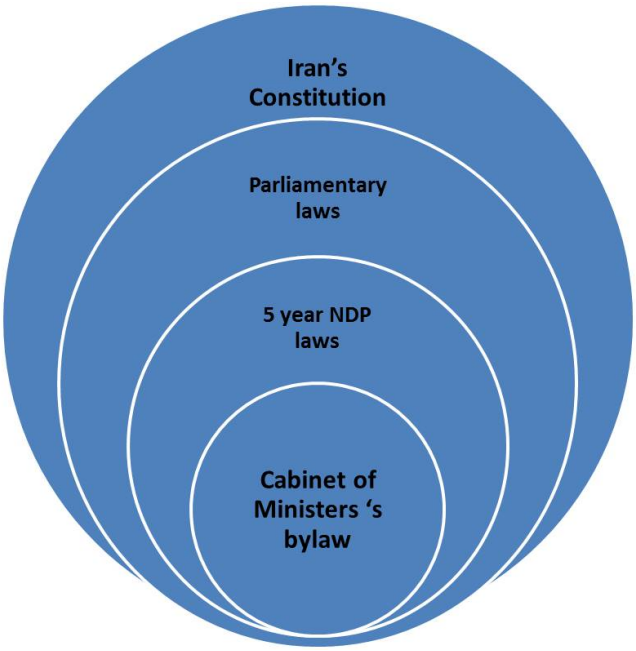

Figure 6.2. The structure of legislative system in Iran

The Iranian parliament has also paid attention to environmental protection of natural resources since the 1950s. The chronology of environmental protection laws which have been passed by the Iranian parliament are:

- Hunting and Fishing Act (1956)
- Water Pollution Control (1969)
- Environmental Protection Act (1974)
- Air Pollution control Act (1995)
- Waste Management Act (2004)

In addition, the ordinary laws of Iran enact the 'Islamic penal code of Iran' which pays attention to environmental issues under Articles 679, 686, and 690 (Taghvaee et al., 2015). Article 690 of the 'Islamic penal code of Iran' states:

"*Everyone who barters, drags, drills, digs trees and agriculture, and so on, into nationalised forests, ranges, mountains, gardens, water resources, springs, natural monuments and national parks, livestock, the cultivation, industry, and other lands and properties owned by the government without the permission of the DoE or other competent authorities to operate that would degrade the environment and Natural resources, are punishable by one month to one-year imprisonment. The court is obliged to dispose of the case, removal of interruptions or the impediment, or reversal of the former situation. "*

6.3 EIA in Iran

6.3.1 EIA legislation in Iran

In some countries, EIA legislation is integral to general environmental law rather than standing alone (Sadler, 1996; Woods, 2003). In Iran the legal basis for EIA is an article in the National Development Plan (NDP) (Khosravi and Jha-Thakur, 2018). NDPs are five-year codified programs drafted by the government and presented to the parliament every 5 years (Zaboli et al., 2016). Environment is one of various chapters included in each NDP. Table 6.1 shows how EIA has been considered in different NDPs in Iran.

Table 6.1. Historic key of EIA in different NDPs of Iran

NDP	2nd (1994-1998)	3rd (1999-2003)	4th (2005-2009)	5th (2010-2015)
Main initiatives of NDP	First legal basis for EIA requirement	Emphasis on EIA for large production and service providing projects DoE to provide executive guideline for EIA DoE and UNDP capacity building program on EIA	Capacity building Executive guidelines Continuation of 3rd NDP obligations Capacity building on SEA (DoE and UNDP)	Emphasis on EIA and monitoring Increase in No. of projects subject to EIA Legal basis for SEA requirement Draft on SEA guideline
NDP Article	82	105	71	192 on EIA 192 on SEA
No. of project types subject EHC approved to EIA	7	17	33	51

(Compiled by author)

EIA was first introduced in 1994 through the Note 82 of the 2nd NDP (1994-1998) (Khosravi and Jha-Thakur, 2018). According to the Note (1994, p.26) "*EIA reports should be provided during the feasibility and site-selection studies for any large projects*". Requirements for conducting an EIA were subsequently provided in the EIA Directive of December 1997 (Yousefi, 2015). Note 82 was then amended by Article 105 of the 3rd NDP (1999-2003), which required the DoE to provide EIA directive and practical guidelines (3rd NDP Report, 1999). At the time the United Nations Development Programme (UNDP) was requested by the DoE to assist in establishing EIA guidelines (UNDP, 2003), and joined forces to do so.

Practical guidelines were published in 2001 to provide support for practitioners on how to comply with the EIA Directive. The Environmental High Council (EHC) also proposed an EIA directive to the Cabinet of Ministers in 2005 based on Article 105 of 3NDP (1999-2003), and this approved in 2008. Article 71 of the 4th NDP (2005-2009) then confirmed Article 105 of the 3rd NDP (4th NDP report, 2005). During this period, the EHC increased the number of project types subject to EIA to 33.

Article 184 of the 5th NDP (2010-2015) focused on conducting an EIA and mentioned SEA of plans and programs at national and regional level (5th NDP Report, 2010). Currently, 55 types of project are subjected to EIA based on the 2017 EHC decree (Khosravi et al., 2019a). Table 6.2 summarises the important initiatives in the development of Iranian Environmental Assessments.

Table 6.2. EA key historical initiatives in EIA legislation in Iran

Initiative	Details
Rio de Janeiro Conference 'our common future' (1992)	Motivated Iran to enact EIA regulation
2nd NDP (1994-1998)	Note 82 is the first legal basis for EIA requirement in Iran
EHC (1994)	Note 82 is implemented through Decree 138 (1994) and approved by EHC. The EHC defined 7 types of projects subject to EIAs
EHC (1997)	Pattern of EIA was approved by EHC in EIA Code of Practice1997
3rd NDP (1999-2003)	Article 105 requires all large projects to be subject to EIA. EHC propose the EIA directive and the Cabinet of Ministries approve it. Note: The DoE is required to provide executive guidelines for EIA.
Capacity building and institutional strengthening of Iran's EIA (DoE and UNDP, 1999)	EIA guidelines provided for related development projects: Petrochemical, Refineries, Steel Industries, Dams, Agro-Industry Units, Rails and Roads, Airport, Land fill, Industrial Parks, Tourism, and Cement.
4th NDP (2005-2009)	Article 71 of the 4th NDP validates and extends Article 105 of the 3rd NDP
EHC (2005)	EHC extends the number of project types that need to meet EIA requirement to 33.
Capacity building program on SEA DoE and UNDP (2004-2005)	The main outcome of the program was setting regulatory framework for SEA which was an important step towards SEA in the 5th NDP
5th NDP (2010-2015)	Article 192 focused on EIA and Article 184 required all plans and programs at national and regional level to be subject to SEA.
EHC (2011)	Article 192 defined 51 types of projects that require an EIA
EIA bill (2014)	The Cabinet of Ministers with the help of the DoE submit the bill, but it was rejected by the parliamentarians.
EHC (2017)	The EHC increased the projects subject to EIA to 55 types.

Source: Adapted from NDP reports 2 (1994), 3 (1999), 4 (2005) and 5 (2010), and UNDP 2003.

Figure 6.3 shows that the number of EIA reports submitted each year has increased considerably over time. Rahmati (2014) provided useful analysis in his paper for the period from 1997 to 2012, but this data is not readily available and therefore has not yet been updated (Khosravi et al., 2019a).

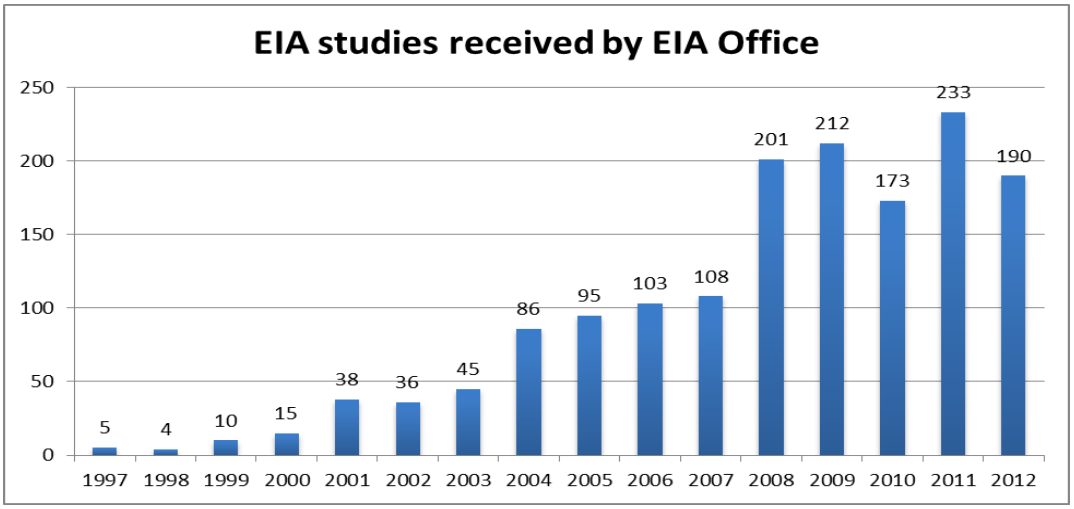

Figure 6.3. Number of EIAs submitted during 1997-2012

Source: Rahmati 2014

In the period from 1997 to 2012, 1552 EIA reports were submitted to the DoE. During this period, major deficiencies prevented 185 reports from being reviewed by the EIA Bureau. Of the remaining 1367 EIA reports that were reviewed by EIA Bureau and EIA Commission, 942 were approved, 231 were approved conditionally, 40 reports were rejected, and 154 reports were sent back for further revision. This is illustrated in Figure 6.4.

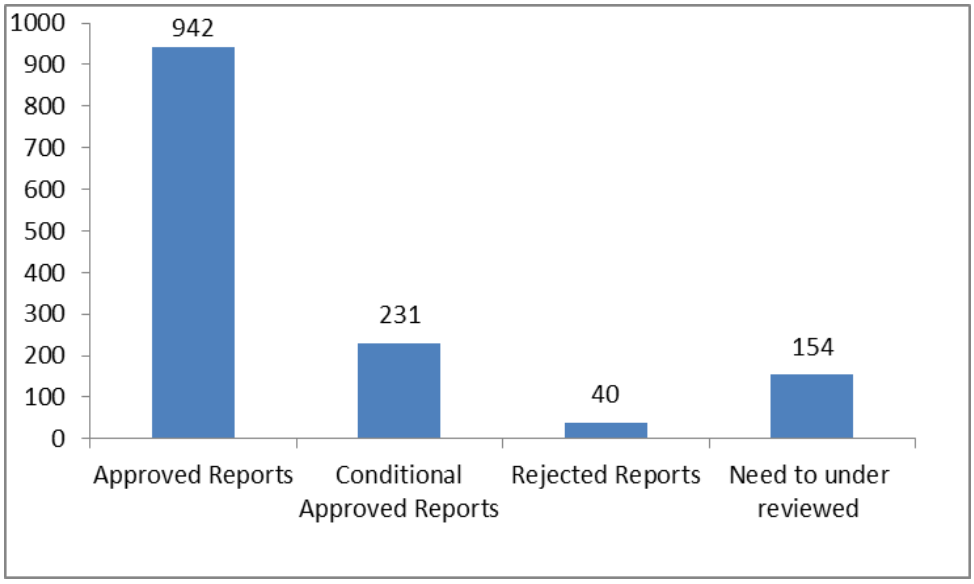

Figure 6.4. Number of Reports Reviewed by EIA Commission during 1997- 2012

Source: Rahmati 2014

6.3.2 EIA process in Iran

Figure 6.5 displays the Iranian EIA process. Once the proponents submit their developmental proposal to the relevant DoE provincial office, screening for EIA is undertaken based on a screening list (Table 6.3) (Khosravi et al., 2019a). If the project is subjected to EIA, the proponents need to prepare an EIA report. The report consists of a description of the project, the surrounding environment, social and economic conditions, law, regulations, potential impacts, mitigation measures, and the Environmental Management Plan (Moradi, 2009). The report is submitted to the provincial EIA office for the initial approval from the provincial EIA committee. If approval is granted by the provincial EIA committee, the report is then forwarded to the EIA Bureau in the DoE. The report is reviewed by the EIA committee mainly based on the report and the presentation given by the proponent.

Table 6.3. List of projects subject to EIA in the Iranian EIA system

No	Project type	Listed since
1	Petrochemical plants in general	1994
2	Refinery plants in general	1994
3	Power plants with a capacity larger than 100 Mega Watt	1994
4	Steel-melting plants	1994
5	Dams with height more than 15 m or related structures that have an area larger than 40 ha or water reservoir that has an area larger than 400 ha	1994
6	Industrial parks with an area larger than 100 ha	1994
7	Airports with more than 2-km long runways (band length)	1994
8	Agro-industry with areas larger than 5000ha	1999
9	Large slaughterhouses	1999
10	Domestic solid waste landfills for cities having population of more than 200,000	1999
11	Composting centres	1999
12	Oil and gas pipelines	2000
13	Oil exploitation in sea or in lakes	2000
14	Oil reservoirs	2000
15	Large forestry projects	2000
16	Highways and freeways	2001
17	Large railway projects	2001
18	Tourism projects	2002
19	Coastal development projects within a range of 1 km from the coast	2004

20	Industrial complexes and units with an area larger than 5000 m2	2004
21	Industrial and related activities, e.g. exhibition halls with an area larger than 10000 m2	2004
22	Chemical and hazardous materials storages with an area larger than 5000 m2	2004
23	Construction campus with an area larger than 10000 m2	2004
24	Fuel storage with capacity more than 1 million litter	2004
25	Bus and trucks terminals with an area larger than 2000 m2	2004
26	Large ranches with an area larger than 5 ha	2004
27	Marine ports, for fishery or oil and gas and dredging (marine construction in general)	2004
28	Wastewater collecting network and treatment centre in city scale	2004
29	Large water treatment in city scale (with capacity more than 5000 m3/day	2004
30	Landfills, e.g. collecting and disposal in city scale	2004
31	Military centres with more than 5000 m2	2004
32	Tourism complexes with an area larger than 10000 m2	2004
33	Film making centres with an area larger than 5000 m2	2004
34	Recreational, educational, research and sport centres with an area larger than 10000m2	2004
35	Copper extraction with a capacity of more than 1 million tons/year	2004
36	Iron extraction with a capacity of more than 600 thousand tons/year	2004
37	Gold extraction in general	2004
38	Lead and zinc extraction with a capacity of more than 100,000 tons/year	2004
39	Coal extraction with a capacity of more than 80,000 tons/year	2004
40	Salt extraction from water with an area larger than 400 ha	2004
41	Cement plants in general	2005
42	Sugar plants in general	2005
43	Gypsum-plaster and limestone manufactories	2005
44	Drug and cosmetic industries in general	2005
45	Large units supplying automotive pieces	2005
46	Used-motor-oil recycling stations	2005
47	Oil/gas fields development projects with more than 10 wells	2005
48	Residential places with a capacity of more than 120 people or an area larger than 2ha	2005
49	Camping site with more than 150 tents or an area larger than 5 ha	2005
50	Recreational and tourist complexes with an area larger than 5 ha	2005
51	Coastal construction (mineral water baths) in general	2005
52	Underground natural gas storage	2017
53	Land extraction from the sea and creating an artificial island	2017
54	Desalination system (Capacity more than 50000 m3)	2017
55	Coke production	2017

Source: Adapted from Moradi, 2009 (Translated from Persian version on the DoE website under "DoE, List of projects subjected to EIA in Iran" at: http://www.iranDoE.org/DoE portal/eia/

The EIA committee consists of representatives of various governmental bodies including (Moradi, 2009): Head of Deputy of Human Environment, Head of EIA Bureau, related expert from EIA Bureau, representative of Deputy of Natural Environment, an academic expert from a University, a representative of NGOs, Head of the related provincial EIA office, and representative of the MPO. According to the Iranian EIA directive (2011) the EIA review process should be reviewed and a decision on the EIA report be reached within 45 days of submission.

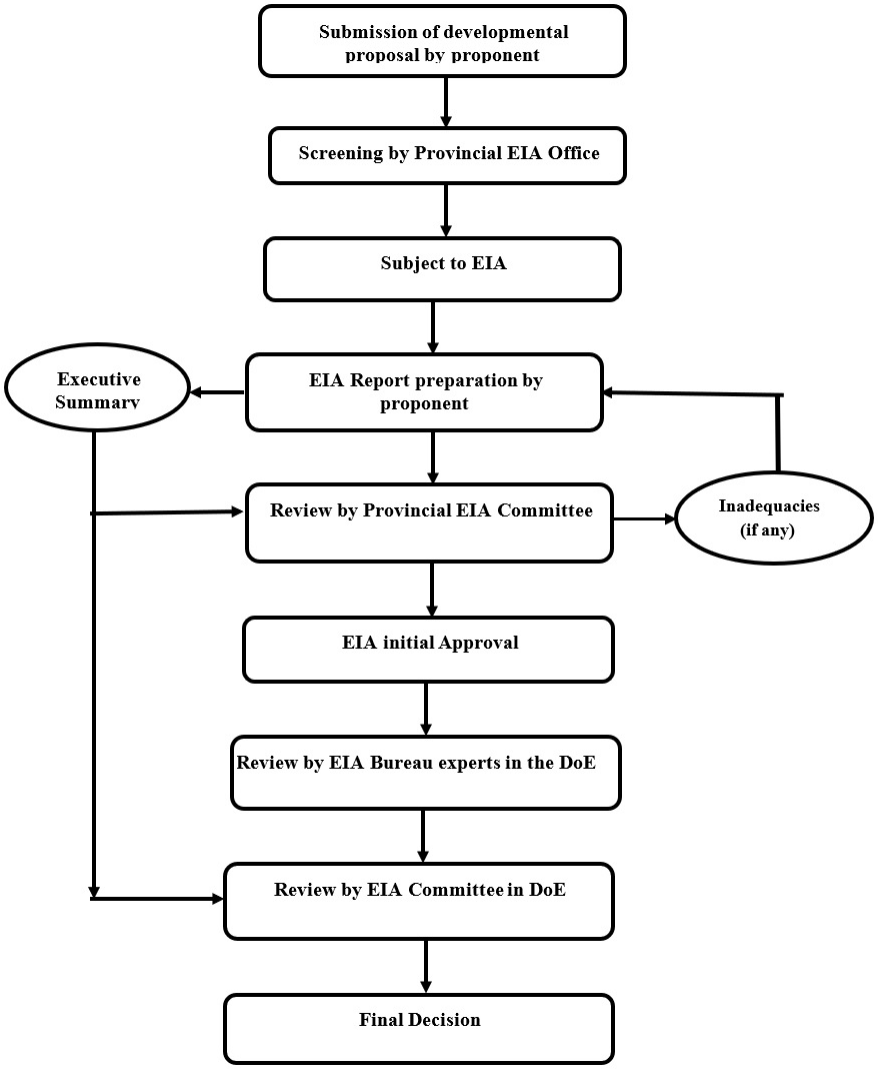

Figure 6.5. The EIA process in Iran

Source: Khosravi et al., 2019a

6.3.3 EIA administration In Iran

The DoE was established in Iran in 1971 (Ahmadvand et al., 2009). Today the DoE remains the primary agent for EIA; with responsibilities for protecting the environment, ensuring legitimate and

sustainable utilisation of natural resources to guarantee sustainable development, controlling pollution, preventing the destruction of the environment, and preserving Iran's biodiversity (Ahmadvand et al., 2009). The competent body for EIA was defined in Decree 138 of 1994 as the DoE, under the authority of the EHC (DoE, 2017). Each province in Iran has a DoE provincial office to monitor all aspects of environmental protection and contributes to EIA at the screening and reviewing stages.

The Iranian DoE organisation consists of 5 deputies, as illustrated in Figure 6.6:

- Deputy of Planning and Education,
- Deputy of Logistics Affairs,
- Deputy of Natural Environment,
- Deputy of Marine Environment,
- Deputy of Human Environment.

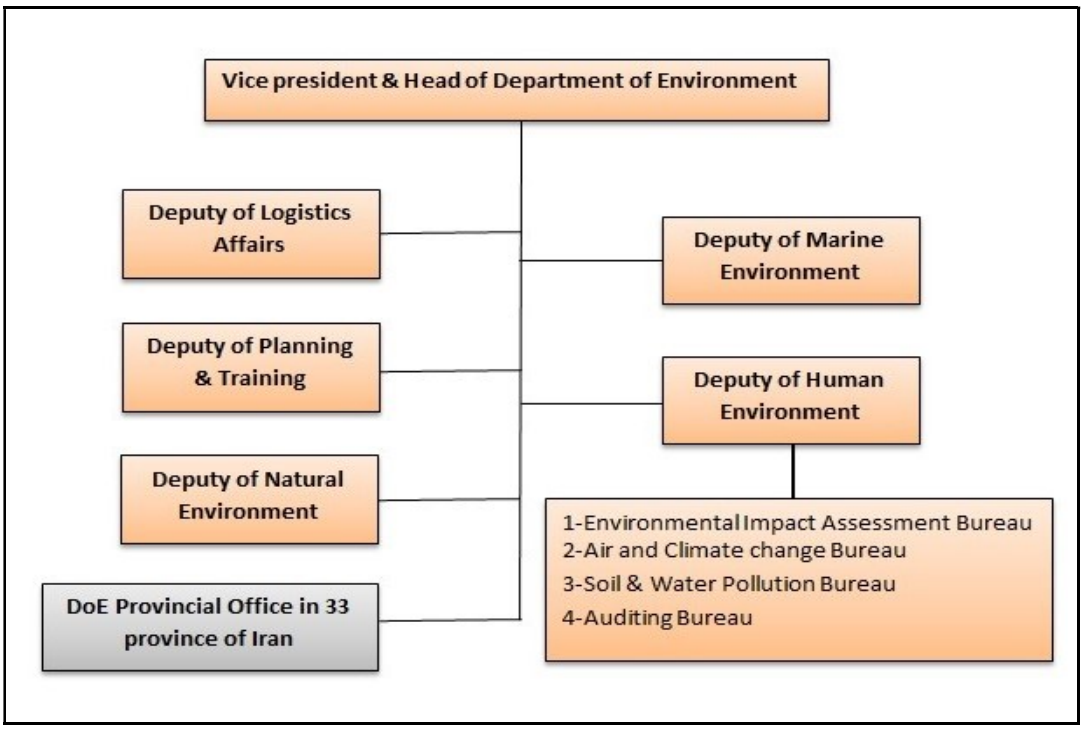

Figure 6.6. Iranian DoE Organisation Structure

Source: Translated from Persian version on the DoE, 2017

In addition to this, the Deputy of Human Environment oversees 4 sections:

- Soil and Water Pollution Bureau,
- Air and Climate Change Bureau,
- Auditing Bureau, and
- EIA Bureau.

6.3.3.1 EIA Bureau

The DoE established the Development Impact Assessment Bureau, under the Division of Human Environment in 1975. This was renamed the EIA Bureau in 1997. The EIA Bureau is currently responsible for supervising the screening process, managing the EIA review and for EIA licensing (Ahmadvand et al., 2009). According to DoE statistics, 18 experts in six groups of three are responsible for reviewing EIA reports within the EIA Bureau (Goldooz, 2010).

EIA Commission in EIA Bureau:

The EIA Commission consists of representatives of various governmental bodies as follows (Act No. 63 of the EHC Iran, 1994):

1. Head of Deputy of Human Environment (As the Head of Commission),
2. Head of EIA Bureau
3. Related expert from EIA Bureau,
4. Representative of Deputy of Natural Environment,
5. Academic expert from University of Environment,
6. Representative of NGOs,
7. Head of the related provincial office,
8. Representative of Management and Planning Organisation (MPO),
9. Representative of the executive organisation.

The final decision is made by three members (1, 8 and 9). Other members such as NGOs have no voting rights (Moradi, 2009). This means the power distribution in the EIA process is unbalanced, and NGOs and other local communities are only non-executive members of the EIA Commission.

There are DoE provincial offices within each of the DoE offices in all 33 provinces there are between one and five experts who review EIA reports (Goldooz, 2010).

6.3.4 SEA in Iran

Although SEA has been internationally established for more than 20 years (Gauthier et al., 2012; Tetlow and Hanusch, 2012), there is still limited experience of SEA in Iran (Khosravi and Jha-Thakur, 2018). The 'Capacity Building Programme on SEA' project was the first step taken by the Iranian Government to promote SEA. This project was conducted by the Iranian DoE with UNDP collaboration between 2004 and 2005 (Organisation for Economic Co-operation and Development, OECD 2006). The main output of the project was a regulatory framework for SEA that led to the adoption of the 5th NDP in 2010. Despite this, SEAs have barely been undertaken in the country to date (Khosravi and Jha-Thakur, 2018). Only one SEA at policy level was completed in Iran in 2004. The Iranian government requested World Bank assistance in reforming Iran's energy policy to enhance economic and environmental sustainability. An Energy-Environmental Review was selected for carrying out the analysis and the assessment of environmental impact of energy was analysed through a range of scenarios using cost-benefit analysis. The result revealed that without price reform and sectoral measures, environmental damage costs would increase to $12 billion, or 6.6 percent of nominal GDP, by 2019 due to subsidised fossil fuel (World Bank, 2012).

6.4 EIA regulation of water use in Iran

The construction of large dams became the subject of debate as they can result in social and environmental costs, unforeseen geological changes, unexpected adverse outcomes, and other negative economic externalities (Mirzo Jalilov, 2010). EIA is an important tool which helps to manage these negative impacts. The initial stage involves determining whether an EIA is required (screening).

According to the Iranian EIA screening list (Table 6.3), large dams with height exceeding 15 m from the foundation will require EIA approval before construction. Iran's EIA screening list is similar to Schedule 1 of the EU EIA directive, but there is no equivalent to Schedule 2. Aggressive dam building has not been free of consequences. The government has been blamed for the numerous dams which have been built without conducting EIA. Inundation of historic sites, human displacement, land use changes, sedimentation, eutrophication, major ecosystem damage and increased downstream development under the perception of increased water availability are among the well-known consequences of dam building in Iran, just as in other parts of the world (Madani et al., 2016).

Based on international practices such as the EU Directive, groundwater abstraction of more than 10 Mm^3 should be subject to an EIA. However, groundwater abstraction or artificial groundwater recharge schemes have not been included in the Iranian screening list. It is fair to say that environmental consideration of groundwater extractions is not being considered currently within the Iranian water management context.

6.5 Chapter summary

The existing literature review of the Iranian EIA system in this chapter revealed that to date little EIA-related research has been undertaken in the country and the attempts that have been done so far do not result in thorough evaluation of the Iranian EIA system. In other words, dearth of literature prevents this review from painting a complete picture of the Iranian EIA system in terms of EIA legislation, EIA process and EIA administration. Therefore, the next chapter provides an empirical chapter reviewing the Iranian EIA system against the criteria framework which was developed in Chapter 3 to identify its strengths and deficiencies.

7 Empirical evaluation of Iran's EIA system

The purpose of this chapter is "to review the status of the EIA system in Iran to identify its strengths and deficiencies", which helps in accomplishing objective one. In this chapter the Iranian EIA system is reviewed against the adapted criteria. As mentioned earlier, due to the embryonic stage of EIA research within the country and very little published information available on the Iranian EIA system, the literature review (Chapter 6) in itself couldn't provide detail understanding of Iran's EIA system. Hence, semi-structured interviews were carried out. These helped in reviewing the Iranian EIA system based on the perception of EIA actors. This chapter is sub-divided into four sections. The first section presents the type of analysis, followed by a summary of the methodology. The third section presents findings of the semi-structured interviews and literature review from the previous chapter, followed by the chapter summary.

7.1 System level analysis of environmental assessment

International EIA evaluations have covered a range of issues, including at systems and project levels (Arts et al., 2012; Cashmore et al., 2009; Zvijáková et al., 2014). At a project level, EIA practice is influenced by the actors involved, as well as their interests and positions (Arts et al., 2012; Fischer and Gazzola, 2006; Hilding-Rydevik and Bjarnadóttir, 2007; Kørnøv and Thissen, 2000; Runhaar and Driessen, 2007). On the other hand, at the system level, EIA depends on characteristics of EIA legislation such as the presence of "follow-up" requirements (Arts, 2012; Sadler, 2004; Wood, 2003).

The main aim of the research underlying this chapter is to evaluate the EIA at system level, and the initial focus is therefore on understanding the elements of the EIA system. Marara et al. (2011) have defined the legal, administrative and procedural framework as three key elements of EIA system in their research. Suwanteep et al. (2016) have also introduced regulation of EIA, authorities involved, and EIA processes as main components. Hence, three common components are identified within the various approaches available of an EIA system; including EIA legislation, EIA administration and EIA Process (Khosravi et al., 2019a).

7.2 Analysis framework of EIA system in Iran

The Iranian EIA system is evaluated in this chapter using Naeem and Hameed's (2008) criteria, which are described in detail in Chapter 2 (see Section 2.5.2). However, as EIA is context-specific, criteria need to be tailored to the idiosyncrasies of the country in which it is applied (Bond and Pope, 2012; Morgan, 2012; Zvijáková et al., 2014). Accordingly, some sub-criteria were modified to suit the Iranian context (see section 2.5.2, Table 2.4). It is important to be aware of differences in perceptions of different EIA actors as their vested interests may loosely skew their perspectives, for example consultants earning money from an EIA study may possibly be more positive than a proponent paying for it (Arts et al., 2012). Care was taken therefore to involve interviewees from competent authorities, consultancies, universities, NGOs and proponents; with the distribution illustrated in Figure 7.1. Thirty interviewees were selected using snowball sampling, commencing with referrals from known contacts in the Iranian EIA community. Due to the range of roles, the sample is considered to be representative of all EIA actors at a national level. This data was further substantiated with a documentary review including official materials such as legislation and reports released by the DoE.

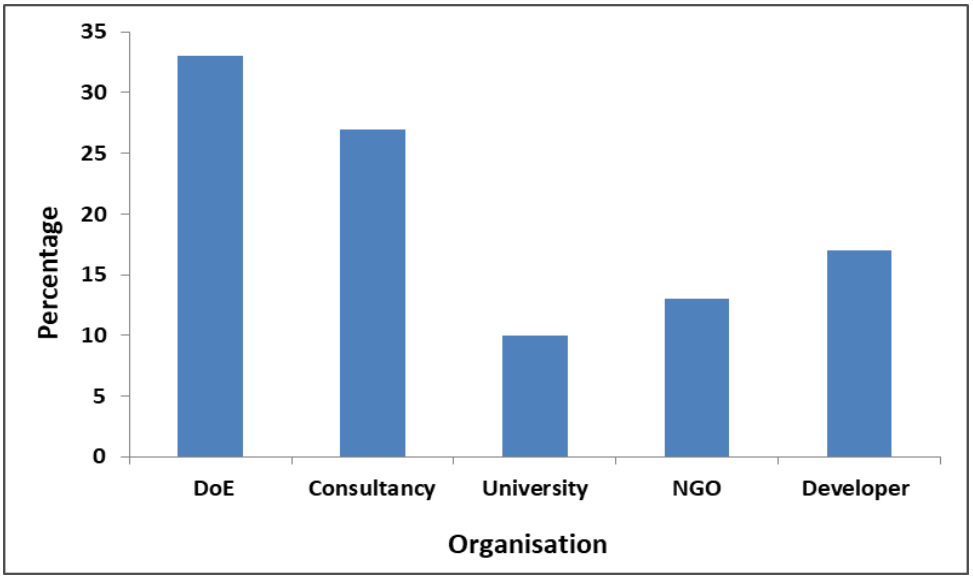

Figure 7.1. First interview participants by organisation type

7.3 Iran's EIA system according to the framework analysis

This section presents the Iranian EIA system according to the framework adopted (see Table 2.4) and is organised along the headings of EIA legislative provision, EIA process and EIA administration.

7.3.1 EIA legislative provision in Iran

Based on literature, Iranian EIA law is a part of the NDP, which means every NDP should be ratified by Parliament before each following 5-year period starts (Moradi, 2009). Moradi's primary concern was that the content of the NDP depends on the current situation and there is no guarantee that EIA will form part of it. His second concern was the lack of specific parliamentary EIA law. The lack of clear penalties for violations has also been highlighted by other authors (Rahmati, 2014). All thirty interviewees agreed with these issues, saying:

> *… "The EIA law is a part of the NDP plan' and seven Interviewees confirmed that ''the content of the NDP depends on the situation to date and any changes in NDP could affect the EIA system".*

Interviewees also mentioned that the NDP only compels developers to provide EIA approval for development projects. In this context, one interviewee commented that:

> *"The current law (the article of the NDP) works well until the approval is issued, but it does not create any executive power for the DoE during project implementation".*

On this basis, EIA only forms part of other laws, and is not a law in its own right.

With regards to the sufficiency of existing Iranian EIA legislation, 63% of the interviewees (19) agreed that the regulations are not sufficient enough to cover all aspects of an EIA system. The DoE's participants believe that EIA legislation is insufficient. They claimed that current EIA law (part of NDP) only compels proponents to prepare EIA reports during the feasibility study but lacks a penal code section for offenders.

Based on article 105 of the 3th NDP:

"All the large productions and services must have EIA study in the process of feasibility study and before execution based on the directive that is provided by the EHC and approved by the Cabinet of ministers. Persons in charge of execution of the project are required to observe findings of the assessment."

As mentioned, Article 105 creates an obligation but fails to provide a clear penal code for proponents who commence their projects without an EIA study.

These interviewees stated that there was an attempt to create EIA specific legislation, with the Cabinet of Ministers and the DoE submitting a Bill to Parliament entitled "EIA of Iran" in 2014. This Bill consisted of 5 chapters, and the 5th chapter dealt with penalties. However, the bill was rejected by parliamentarians. Other interviewees weren't aware of this effort.

Another topic which emerged from some interviews was the issue of 'strong environmental legislation versus weak implementation'. Of the eight interviewees (27%) who claimed that the current EIA legal basis is sufficient, five were from consultancy and three from NGOs. These interviewees claimed that the main problem lies in the administration of the law and that there is a gap between legislation and implementation. Four interviewees commented that the DoE could deal with proponents who do not comply with the EIA under Article 8 of the EIA directive. This article requires that:

"The DoE is obliged to issue a notice to the developer who does not comply with the EIA report in two instalments with a 20-day deadline, and in the absence of consideration, developer should be treated in accordance with Article 690 of the law of Islamic Penal Code" (See section 6.2).

An EIA expert in the Ministry of Petroleum claimed that Article 8 of the EIA directive has considered penalties for the EIA offenders based on Article 690 of the Islamic penal code, but the DoE cannot enforce EIA implementation. However, two interviewees claim that if a proponent commenced a project without an EIA, Article 690 could not stop the project proceeding without EIA approval, only

compels them to pay a penalty for environmental degradation. The proponent could therefore pay the penalty and continue the project. One interviewee from a proponent confirms this claim:

> *"We commenced a railway project without EIA approval, and we received a letter from the court regarding environmental degradation in project area (but not because of lack of EIA). Thus, we could continue our construction by paying the fine."*

Figure 7.2 shows eight interviewees (27%) thought EIA legislation is sufficient. However, the backgrounds of six of these are from consultancy and two from NGOs, who may not be familiar with EIA legislation.

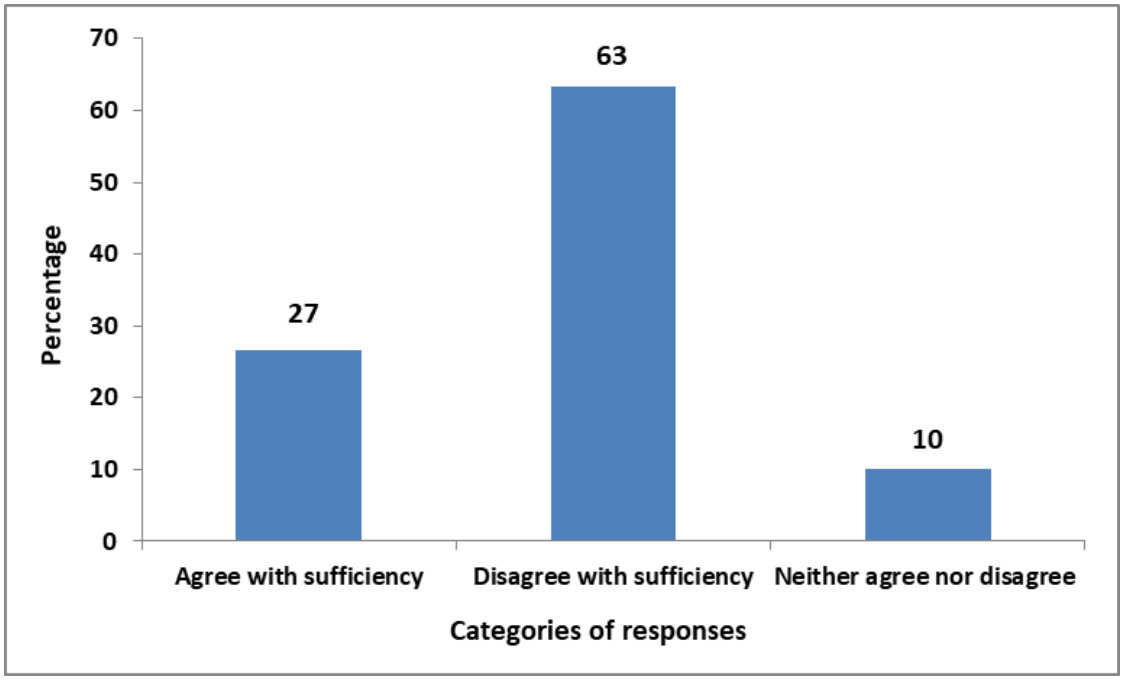

Figure 7.2. Responses to the question of EIA sufficiency

Overall, based on evidence in literature and these findings (63% of interviewees believe that the NDP is not sufficient), it is probably fair to say EIA legislation is a weakness for EIA in Iran and it lacks sufficient penalties for failing to carry out an EIA.

Interviewees were also asked about the EIA process steps mandatory in regulations, and several interviewees provided insights into this question. One Interviewee summarised the position as follows:

…"As long as there is no independent law for EIA, there is no law for its individual steps and if we had an independent EIA law, we could have included other EIA steps within that law."

The same interviewee adds that:

…. "Apart from public participation, all steps of EIA process have been mentioned clearly in the Iranian EIA directive and only public participation has been neglected completely in the directive and other guidelines."

Accordingly, some interviewees mentioned that a recent investigation which was completed by the Iranian General Inspection Organisation (IGIO) has revealed that a total of 174 projects have commenced without EIA approval. The interviewees were further questioned about the implications of proceeding without EIA approval. Key reasons provided by interviewees for starting a project without EIA approval are summarised in Figure 7.3.

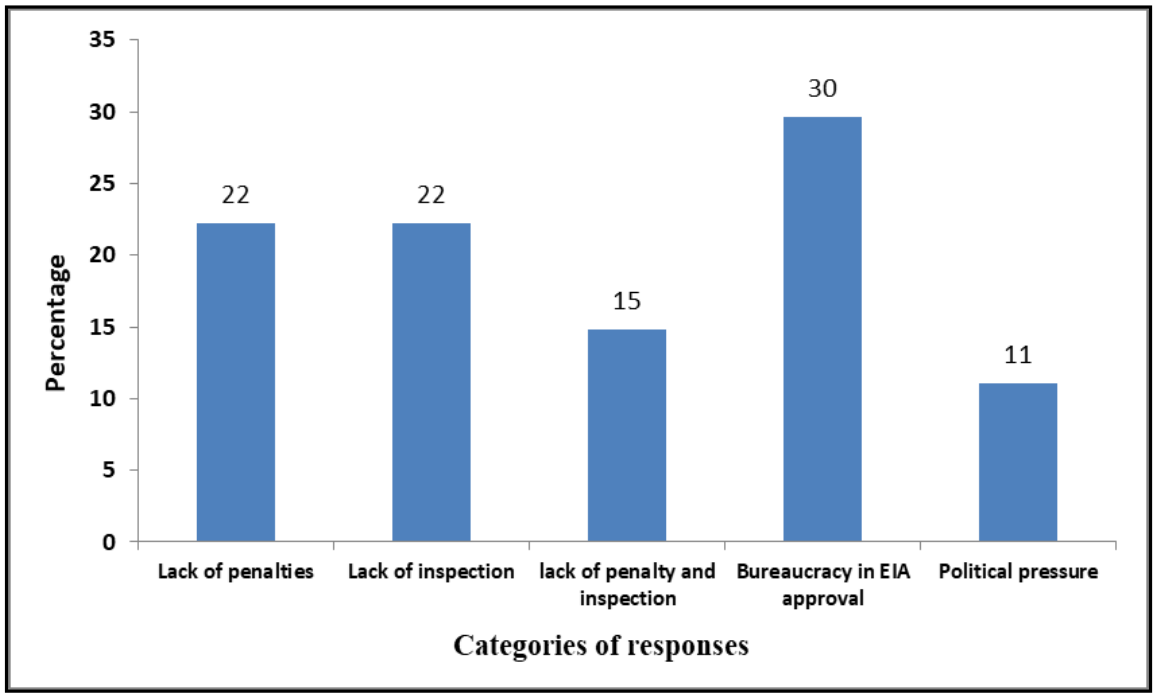

Figure 7.3. Reasons for starting projects without EIA approvals

- **Lack of penalties**

Six interviewees (22%) from the EIA Bureau stated that due to lack of penalties for violations, courts could not issue a verdict against proponents who had started their projects without an EIA. Proponents sometimes dare to commence their project without an EIA for this reason. One interviewee from the DoE stated:

> *…." A motorway began construction without EIA approval in a national park. However, the project was stopped by DoE not due to the absence an EIA approval but based on other laws (National park protection laws)."*

- **Lack of inspection**

Six interviewees (22%), mostly working in EIA consultancies, said the DoE weakness in carrying out inspections was the most important reason allowing proponents to begin projects without an EIA.

- **Lack of penalty and inspection**

Four interviewees (15%) claimed that lack of both clear punishment and strong inspection made it easier for some proponents to violate the EIA requirement. One interviewee added:

> *… "The enforcement of an EIA law can make the DoE and local EIA offices more responsible and compel them to have strong inspection plans. In addition to this, a clear punishment chapter and stronger EIA law make judicial review to issue a verdict for offenders based on the absence of EIA approval."*

- **Bureaucracy in EIA approval**

Interestingly, nine interviewees (30%) - who were mostly developers - stated that the EIA approval process was very bureaucratic and took too much time to complete. One interviewee stated further that:

… "Most EIA approval process in EIA Bureau may take even 3 or 4 years. Consequently, it is common for the developer who has its budget to begin the project while EIA process is being carried out."

- **Political pressure**

Finally, 3 interviewees (11%) mentioned that political pressure could be another reason why proponents start their projects without EIA approval. Some regional proponents and lobbyists use their power and influence to start important projects without EIA studies.

7.3.2 EIA Administration in Iran

All interviewees were asked about responsibility of EIA reviewing and all stated that the EIA Bureau is responsible for reviewing EIA reports. The final decision is made by three members of EIA commission at national level and other members such as NGOs have no voting rights (Moradi, 2009). This means the power distribution in the EIA process is unbalanced, and NGOs and other local communities are only non-executive members of the EIA Commission. The Iranian EIA institutional framework reveals the system is too centralised at the national level and without the local basis that could improve its effectiveness. The Head of the EIA Bureau confirmed this and stated that, to resolve this problem, the EIA Bureau had formed a provincial EIA Commission in 2013 to give local organisations an opportunity to participate in the EIA process. If a provincial commission doesn't approve the EIA, then the report is not sent to the EIA Bureau for final review. In addition, 20 types of project have recently been delegated to provincial EIA Commission to review and to make the final decision.

7.3.3 EIA process in Iran

7.3.3.1 Screening

Screening in Iran is based on thresholds prepared by the EHC (Ahmadvand et al., 2009; Moradi, 2009). For screening, proponents submit the proposal to the DoE provincial office. If the project falls

into the list in Table 6.3, they will then be asked to prepare an EIA report. Interviewees were asked about how screening is decided in Iran, and all confirmed that the screening in Iran is based on the threshold which is the benchmark of the project size. It means, this list of projects is not followed on a case-by-case basis if the project type is not specified in the list.

Nineteen interviewees were asked about screening coverage based on their role in the EIA system. Five interviewees (26%) considered the list to be complete. On the other hand, 14 interviewees (74%) claimed that this list does not cover all projects, and projects such as urban development projects were not in the list. Furthermore, the scale does not allow some projects to be included. For example, only dams with a height above 15m need to be subjected to EIA, but the question should be asked whether dams with a height below 15m have an environmental impact or not?

One interviewee from the DoE claimed that: *"the screening list is not complete; however, the DoE at national and provincial level lacks qualified human resource to apply a case-by-case approach."*

Interviewees claimed that the screening list needs to be followed on a case-by-case approach, because the scale does not allow for some projects to be included. However, they also believed that there is a shortage of resource capacity in all provinces which hampers a case-by-case approach.

7.3.3.2 Scoping

Scoping in Iran is based on EIA guidelines and terms of reference (TOR) prepared by the DoE (Ahmadvand et al; 2009; Moradi, 2009). Until now these guidelines have not been updated, which means this stage is very static and lacks public participation.

Twenty-one interviewees were asked about scoping. Developers were excluded from scoping questions as initial discussions revealed that they were not aware of the scoping process. This indicates insufficient stakeholder engagement at this stage and that developers are not sure about what kind of impacts and issues needed to be included in EIA. This is problematic because literature shows EIA itself is unlikely to be effective without meaningful engagement of relevant stakeholders (Aung, 2017).

As mentioned in Chapter 3, Fischer and Phylip-Jones (2008) state the purpose of scoping is to identify the important issues to be considered in an EIA, to determine the appropriate space and time boundaries for the EIA, to establish the information necessary for decision-making, and anticipate the significant factors to be studied in detail. Understanding of the scoping stage is not coherent in Iran, as 42% (9) of interviewees stated that there is scoping stage in the EIA process. Furthermore, scoping is perceived as a stage at which geographical boundaries are merely defined for the EIA study. These interviewees were from consultancies, the EIA Bureau and universities. One interviewee stated that:

"The scoping stage has been completely forgotten and most EIA reports in Iran are prepared based on the TOR which have been prepared by the DoE."

On the other hand, 58% (12) of interviewees mostly from the EIA bureau and NGOs, who believed that scoping means identifying significant issues and determining those that need to be addressed in the EIA, said that the scoping step is bypassed in Iran by writing EIA reports according to a guideline or other terms of reference. This group was also interested to know more about how scoping should be done according to international scoping guidance.

Interviews confirm that the scoping stage has been neglected completely in the EIA process in Iran, to the extent that some interviewees didn't know how scoping should be undertaken.

7.3.3.3 Assessment of alternatives

Moradi (2009) noted that consideration of alternatives in the Iranian EIA system is mentioned in the Iranian EIA directive, which requires that technical and spatial alternatives of a project should be included in the EIA report. Goldooz (2010) believed that the examination of alternatives was not actually happening in Iran and in some cases, proponents consider alternative sites and evaluate them based on economic criteria such as distance from roads, water availabilities and fuel. However, environmental criteria in assessing alternatives are not being considered in the Iranian EIA system.

Most respondents commented that only two alternatives are considered in EIA reports; the proposed project (i.e. the preferred option), and the zero (i.e. no action) alternative. The interviewees were asked about the reasons behind not considering technical and spatial alternatives in EIA process (see Figure 7.4). Eleven interviewees stated that EIA is conducted at the latest project plan stage when most of the details have been finalised and there is no opportunity to consider alternatives. One Interviewee mentioned: *"I have never seen a project that conducts the EIA study before decision making. Therefore, there is no opportunity for the EIA to assess alternatives".*

Eight interviewees said that even if the projects have spatial alternatives, the final alternative is selected only based on economic criteria in the feasibility phase. Six interviewees also pointed out that political issue on some projects predetermined the location of the project; that is, projects do not consider any spatial alternatives during the planning process.

Interestingly, 11 of the interviewees also confirmed that since 2013 the EIA Bureau would only review EIA reports that have considered alternatives. However, according to the interviewees, this requirement has led some proponents and consultants to provide for fake alternatives.

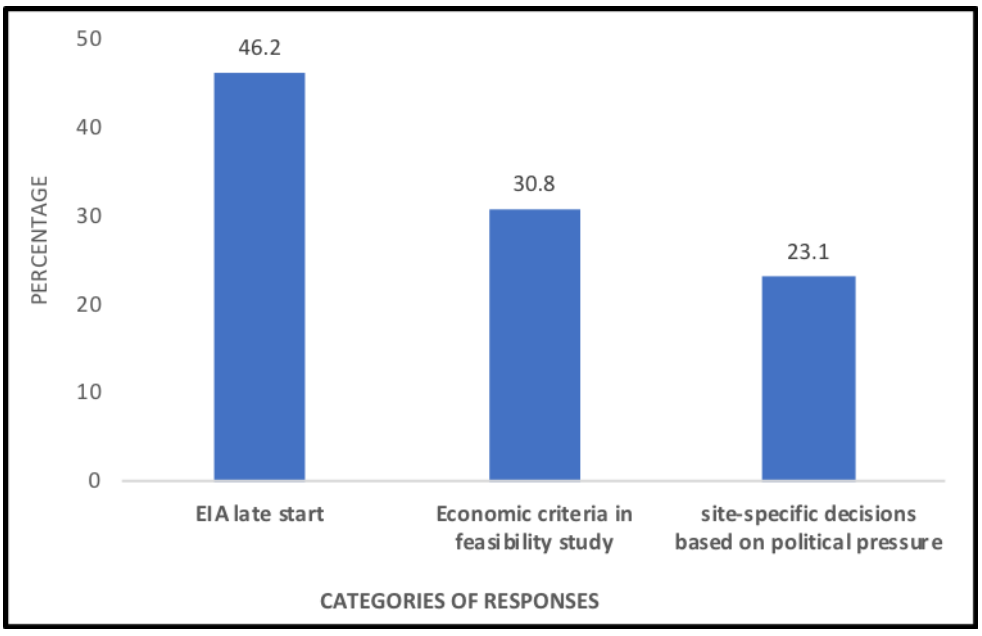

Figure 7.4. Reasons for not considering alternatives in EIA process

7.3.3.4 Public participation

Public participation is practically ignored in Iranian EIA process (Nouri and Nikoomaram, 2005; Moradi, 2009). Ahmadvand et al. (2009) confirmed that there is no legal requirement for public participation. Moradi (2009) also stated that whilst an representative NGO takes part in the EIA Commission on behalf of the public, based on an EIA directive, the final decision is decided by the competent authority. The representative of the NGO, therefore, has no role in decision-making (see section 6.3.2).

Interview participants were asked whether they could confirm the absence of public participants from the EIA process. Nineteen interviewees (86%) of the 22 interviewees who responded to this question noted the absence of public participation in the EIA process. Three interviewees claimed that the main reason for this was that public participation had not been included in the 'Iranian EIA directive 'and 'Guidance to EIA report ', meaning there is no requirement for involving the public and stakeholders during the Iranian EIA process. However, two interviewees added an important point regarding public participation in Iran:

> …*"The Iranian dominant culture is centralised decision-making which hinders the development of public participation culture not only in EIA project but also all projects in Iran."*

In this context, Chen (2013) confirmed this issue and stated that in many developing countries the centralised and top-down governance mode is likely to constrain the development of public participation provisions in EIA. Further, 2 interviewees claimed that low-level education of the public can also constrain effective public participation.

> …*"Lack of environmental awareness's public and NGOs can derail the essence of public participation and in turn the result of public participation is not meaningful."*

In this regard, Sinclair et al. (2000) claimed that literacy is an important factor affecting public participation in the EIA process in India. Chen (2013) also confirmed this and stated that "*Poor literacy can restrict the constructive input of the public in the EIA process.*"

One Interviewee contributed further insight:

"Provincial EIA Commission has been established in 2013 to involve local authorities and NGOs in the EIA process to overcome this weakness. Thus, EIA reports first are discussed in provincial commission and then are reviewed by the EIA Bureau. Moreover 20 types of projects have been delegated to these provincial commissions to make decision. In this way, local authorities, NGOs, and the public are given chance to get involved in the EIA process. Before 2013, EIA was too centralised at the national level which limited local awareness about environmental issues in the EIA process."

Interestingly, 14% (4) of the interviewees - mostly from water resource consultancies - thought that there was a form of public participation. They said that it was carried out for resettlement projects that directly affect people's livelihoods. The affected people were informed about the project impacts and their views were collected using a questionnaire. (Khosravi et al. 2019).

7.3.3.5 Review of EIA reports

EIA reports are reviewed at two levels in Iran; provincial and national level. An EIA report is first reviewed by the experts at the provincial EIA Commission and its deficiencies are identified. The report is then passed to the EIA Bureau in Tehran. The EIA Bureau reviewers will identify any deficiency or inconsistency in the EIA report and send it back to the relevant consultant to comply with the EIA requirement (Yousefi et al., 2015). If the consultant resolves the deficiencies, the report will be passed to the EIA Commission. The EIA Commission will discuss the impact of the project and make a final decision. The EIA Directive (2011) states that the EIA Bureau should review and decide on the preliminary EIA report within 20 days, and on the full EIA report within 45 days of submission.

One interviewee mentioned that: *''EIA reviewing is exclusively done by the EIA Commission in the DoE; however, the Commission members are not qualified enough to review EIA reports and make decisions''.*

Twenty interviewees were asked about EIA reviewing durations. Fifteen interviewees, all from consultancies and proponents, complained that the review process is time-consuming and that an

evaluation by the committee can take two to three years. Eight interviewees confirmed that this bureaucratic process lead to proponents starting their projects early.

Five interviewees, all from the EIA Bureau, stated that the 45-day deadline applies to reports that are complete. Incomplete reports should be referred to the proponents to eliminate deficiencies. Interviewees all said that the report should be well documented, and a response would be given to proponents within 45 days. However, the interviewees all said that most EIA reports have deficiencies.

7.3.3.6 Implementation of mitigation measures

Moradi (2009) states "*One of the major problems of the Iranian EIA reports is that mitigation and monitoring plans were not well structured and presented*". He mentioned proposed mitigation measures also do not seem to be the most appropriate for the planned project activities and are usually prepared in a speculative way. Ghoddoosi (2006) similarly claim the shortcomings in implementation of mitigation measures are result on the lack of legal enforcement for implementation of mitigation measures, and the proposed mitigation measures were sometimes speculative and irrelevant.

Twenty-one interviewees based on their role in the EIA system were asked whether the EIA mitigation plans were implemented. All stated that they were not, and the supervisor of the DOE's Auditing office confirmed that EIA terms and conditions hadn't been fulfilled in most project visits. Four interviewees claimed that mitigation is not implemented in Iran due to the lack of penalties, with one interviewee saying:

"…. as long as there is no EIA specific legislation, there is no requirement to implement EIA. "

However, according to Article 8 of the Iranian EIA directive (2011), if the proponents don't implement EIA's terms and conditions, they are to be punished in accordance with Article 690 of the Islamic penal code. Interestingly, eleven interviewees stated that due to lack of auditing, which should be done by the DoE, the proponents are not compelled to fulfil EIA terms and conditions.

Three interviewees confirmed this issue and stated that the DoE is strict until the licensing stage, and then it lacks executive implementation.

7.3.3.7 EIA follow-up

Glasson et al. (2005) state, monitoring and inspection of project implementation following approval are often absent from the EIA process. Lack of monitoring and inspection in the Iranian EIA process was also identified as a serious deficiency by Ghodoosi et al. (2006) and Moradi (2009), and this weakness was confirmed by interviewees. Interviewees were asked whether monitoring took place, and all confirmed that monitoring was not implemented.

The interview participants were also asked about the inspection step in the EIA process. They claimed that the enforcement of EIA terms and condition should be carried out by site visits from the provincial EIA offices. All interviewees said that inspection was very weak, and it was conducted at random due to a shortage of personnel in the DoE and the provincial body. One interviewee in this case mentioned that:

> *"…. Inspections are conducted at random because there is no requirement to do them. If we have a requirement to do inspections, the DoE should provide staff to do inspections regularly. "*

The inspection office in the DoE had only one staff member and he stated that the serious lack of personnel in Tehran and all provinces meant it was not possible to conduct site visits to oversee whether the developer has implemented the EIA. Consequently, he was obliged to inspect all provinces at random and pointed out that most random site visits showed a lack of enforcement of EIA approval. One individual stated that a possible reason for this may have been that the delivery bodies are the government itself (Central and provincial body of the DoE). One interviewee even stated that:

> *"After a developer receives the permission, forget its implementation, because there is no enforcement to make sure they are complying with the requirements of the permission."*

Table 7.1 summarises the enduring problems of the Iranian EIA system that have been identified in the analysis. The performance column indicates whether there is enough evidence to conclude that the criteria have been met fully, some evidence that criteria may be partially adopted with gaps in the system, or that there is evidence indicating criteria are not being met.

Table 7.1. The performance of the EIA system in Iran

Criteria	Sub criteria	Performance of EIA
Legislative provisions for EIA	EIA- specific law	O
	Adequacy of the law for conducting an EIA	©
	The EIA process steps in regulations	O
	Implications of proceeding without EIA approval	O
Administrative set up for EIA	Competent authority for EIA	©
	EIA review body	©
	EIA centralisation at the national level	©
EIA process	Screening	©
	Scoping	O
	Consideration of alternatives	©
	Public participation	O
	EIA reviewing	©
	EIA Follow-up	O

●– Fully achieved, © – Partially achieved, O – Not achieved at all

7.3.3.8 Contextual factors

Contextual factors are not part of the EIA system but affect its effectiveness (Kolhoff et al. 2016). Some factors are most frequently mentioned by interviewees as factors that affect the EIA process in Iran. Hence, the researcher found the contextual factors that affect Iranian EIA system during interviews are as follows: Culture of decision-making, political pressure, changing government, and organisational capacity. As mentioned in literature, the assessment of EIA effectiveness can be meaningful when considering contextual factors within which EIA operates (Morgan 2012; Bond and Pope 2012; Khosravi et al., 2019b). Therefore, these contextual factors which were identified during the first round of interview will be used in second round of interview to test how they can influence the effectiveness of the Iranian EIA system.

7.4 Chapter summary

Iran is a developing country in which EIA has been presented for more than 20 years. Dearth of literature prevents a literature review from painting a complete picture of the Iranian EIA system. Therefore, this chapter has used a combination of literature review, and semi-structured interviews. This triangulation of data sources helped to have a complete review and further strengthens the validity of the findings. Deficiencies in screening and scoping, the lack of public participation, lack of EIA implementation, EIA monitoring, weak inspection have been confirmed by interviewees as weakness points of the Iranian EIA system in this chapter. This chapter expects to make contributions to the understanding of the EIA legal framework, EIA process and EIA implementation in Iran. While this chapter provided a broad understanding of the Iranian EIA system in Iran, the next chapter narrows the study and focuses on the effectiveness of EIA in the water management sector in Urmia Lake Basin.

8 Empirical examination of EIA effectiveness in Iran's water management sector

The purpose of this chapter is to answer the third objective of this research, which is "*to examine the EIA effectiveness in ULB*". EIA effectiveness is examined using document analysis, semi-structured interviews, and site visits based on the criteria framework set out in Chapter 2. This chapter is sub-divided into three sections. The first section provides a summary of framework analysis. The second section presents findings and is followed by a summary of the EIA effectiveness in ULB.

8.1 EIA effectiveness in ULB

As mentioned in case selection section in Chapter 2, there are 53 operational dams in ULB, and 34 dams were exempted from obligatory EIA. Nineteen dams are included in screening list and must have the EIA report and 11 out of the 19 dams were constructed before EIA emergence in Iran. According to EIA Bureau data, out of all dams only three had EIA report. Hence these three are considered as our case studies. EIA effectiveness in the ULB is examined using the criteria framework, which was described in detail in Section 2.5.3. For some of the set criterion, evidence was not found in the EIA reports. Therefore, interviews and site visits were used to complement the EIA report analysis to cover all questions in the criteria of the framework. Twenty interviewees were selected using snowball sampling, commencing with referrals from known contacts in the Iranian EIA community and water authorities (see Section 2.5.3.2). In this section, EIA effectiveness in ULB is discussed, based on an application of the framework. Results are categorised in three sections; procedural effectiveness, substantive effectiveness and contextual factors.

8.1.1 Procedural effectiveness in ULB

Procedural effectiveness in ULB is examined according to six criteria, which have been introduced in table 2.7 and described in Chapter 2.

8.1.1.1 Scoping

Analysis of the three EIA reports reveals that they have similar terms of reference (TOR). This is in line with interviewees' responses that scoping is bypassed in Iran by using a generic TOR for EIA reports. There is no comprehensive stakeholder participation at the scoping stage either, and developers are not sure about what kind of impacts and issues need to be included in the EIA.

8.1.1.2 Assessment of alternatives

Interviewees suggested that EIA studies were conducted only after site selection had already been completed. In two of the three cases, this was said to have happened only after the construction phase had already started. This may be either due to political pressure or to the bureaucratic nature of the EIA approval process, which could delay decisions. Therefore, there is no meaningful consideration of alternatives in EIA. In this context, one interviewee from the water authority in East Azarbayjan stated that:

> … *"EIA approval is very bureaucratic and takes too much time even 4 years, therefore we cannot wait for EIA committee while the MoE has approved budget to build the dam."*

Document analysis confirms this claim since Zola Dam was built between 2001 and 2010, but EIA approval was only obtained in 2006. It is claimed that the 5 years delay has been due to bureaucracy hurdles in the EIA approval process. Kani Sib's EIA committee was held in 2013, but construction had already made 10 percent physical progress and no EIA approval had been granted. Although interviewees claimed that two alternatives were considered, consisting of the proposed project along with the zero alternative, this couldn't be confirmed by document analysis. Barandoz Dam's EIA report only focused on the final alternative, and there was no evidence to suggest that the EIA consultant had considered the zero (i.e. no action) alternative. Various technical options of Kani Sib Dam are mentioned in the first chapter of the EIA report, but the final alternative is said to have been chosen based on the availability of construction material and economic parameters. The same weakness was observed in Zola Dam's EIA report in which only the preferred alternative was considered in the EIA study.

8.1.1.3 Participation

There is no evidence of public participation in the three EIA reports. This was confirmed by most interviewees. At the provincial level though, there is a public participation office of regional water companies which was established in 2010. Interviewees in West Azarbayjan Water Company said that they were pioneering in the establishment of a public participation office in Provincial Water Companies. Also, the public has been engaged in discussions on the operational programmes of some dams, involving a local Water Cooperative. In cases where indigenous communities raised objections with a dam construction in their region, the Water Company is said to have given due consideration to their concerns. The head of the public participation office in West Azarbayjan pointed out that they aim to consider concerns of local people in water allocation seriously. Therefore, there is some evidence of public participation in Iranian water management, though this is currently not facilitated through the EIA process.

The interviewees were also asked about accessibility to EIA reports. Some believed in the transparency of the EIA process, but also said they were not allowed to provide public access to the EIA reports. Hence, EIA reports are treated as confidential documents and the public do not have access to them. This means that there is no transparency and hence effective involvement does not happen (Fischer 2005).

8.1.1.4 Consideration of cumulative effects

Interviewees suggested that the cumulative effect of several dams along the same river are currently not addressed in any EIAs. They claim that consideration of cumulative impact is completely absent from the Iranian EIA process, and some mentioned that there is no legal provision for cumulative or basin impact assessments to be considered. One interviewee added that consideration of cumulative impact has not been included in the Iranian EIA directive. Moreover, all EIA reports are prepared based on a generic TOR, therefore consultancies consider cumulative impacts based on other developments in the region during scoping. Analysis of the EIA case studies confirm this. Zola and Derik Dam have been built on different branches of the same river (Zola River) and Derik Dam was

constructed before Zola. However, there is no mention of Derik Dam's effects being considered in Zola Dam's EIA, implying that Zola Dam's EIA ignored the possible cumulative effects of Derik Dam. Figure 8.3 shows the dried-up riverbed of Zola river downstream during a wet month. A similar situation exists with the Kani Sib Dam, which was constructed on the Zab River downstream of the Sardasht Dam. Again, there is no evidence of Sardasht Dam's effect in Kani Sib's EIA report.

Interestingly, while interviewees were asked about consideration of cumulative impact in EIA reports, some mentioned that these individual EIAs cannot consider the impacts of the massive developments in the basin and ULB requires an SEA to be prepared. Some interviewees, mostly from consultancies, stated that cumulative impact is not considered in the ULB and elsewhere. There is therefore a need to include SEA in the Iranian water management sector. It is important to note that legal requirements for the assessment of policies, plans and programs is provided as a part of 5th NDP in 2010. The Head of EIA Bureau during first set of interviews stated that they were aware of the need for SEA in some development areas but didn't have the capacity and understanding necessary to conduct it.

8.1.1.5 EIA follow-up

All interviewees in both rounds of interviews confirmed that follow-up practice is very limited in Iran. Based on Jha-Thakur et al. (2009), a follow-up design needs to determine roles and responsibilities, scope of follow-up issues and methodologies for the follow-up programme. Document analysis of the three EIA reports shows that EIA follow-up design was not considered properly. For example, allocation of tasks, roles and responsibilities of stakeholders is not clear, and the EIA reports failed to explain how monitoring should be conducted. Site visits and inspections are tools that can be used in follow-up programmes (Baker, 2004; Jha-Thakur et al., 2009; Nicolaisen and Fischer, 2016). Previous interviews claimed that inspections were very weak and were conducted randomly due to a shortage of resource capacity in the DoE at national and the provincial levels. Interviewees in provinces confirmed this claim and mentioned that shortage of a skilled workforce is the main reason why they use random inspections.

Interviewees further confirmed that mitigation plans were not implemented. Since building a dam in a river is expected to lead to a decrease in flow downstream, causing a significant impact, one of the most important mitigation measures during the operation stage in a dam's EIA report is the management of change in downstream water quantity. Environmental flow requirements for the sake of downstream water rights has been recommended as a mitigation measure in all three reports. Interviewees were asked about the implementation of water rights mitigation measures. All stated that this was not implemented by the MoE.

The most commonly used method for determining historical flow is the Tennant method, also known as the Montana method (Tharme, 2003; Karimi et al. 2012). This specifies that 10% of the average flow is the lower limit for aquatic life and 30% of the average flow is needed to provide a satisfactory stream environment (Beca, 2008). In order to prevent the total drying up of riverbeds, Iran's MoE has provided a guideline based on the Tennant method for the maintenance of a constant minimum flow. Interviewees stated that consultants must consider this guideline in providing dams' Environmental Management Plans (EMP). Representatives of Environmental and Water authorities declared during interview that, to date, these guidelines were not being complied with. This was confirmed during a site visit, where the Zola River downstream of Zola Dam was found to be completely dry before reaching Urmia Lake (Figure 8.1). This is despite the MoE's commitment to allocate an environmental water requirement, according to its EIA.

Figure 8.1. The dried-up riverbed of Zola river downstream of Zola and Derik dam

Source: Khosravi, April 2018

8.1.2 Substantive effectiveness in ULB

8.1.2.1 Decision-making:

Seventeen participants were asked for their opinion as to what main effect the EIA had on decision-making. All interviewees claimed there were few examples where dialogue between EIA practitioners and proponents led to project modification before the submission of the EIA report, which confirmed that EIA has had a very limited influence on decision-making. Ten interviewees (59%) believed that the decisions had already been made before the EIA study, so it could hardly

influence outcomes. They believed that the EIA often takes place late in the planning process and as a result, decisions have already been made when EIA starts. Therefore, EIA is mainly used in legitimising the projects rather than to assess them. Two interviewees (12%) stated that an EIA is sometimes conducted in parallel with the engineering design stages, and the outcome of the EIA could affect the project design. However, some proponents are not open towards changes to the project's design during the EIA process, and resist changes to their design. Furthermore, five interviewees (29%) claimed that impact on the project and effect on design would come from the EIA Committee rather than consultancies, because there is no clear communication between the proponent and the consultant (Figure 8.2).

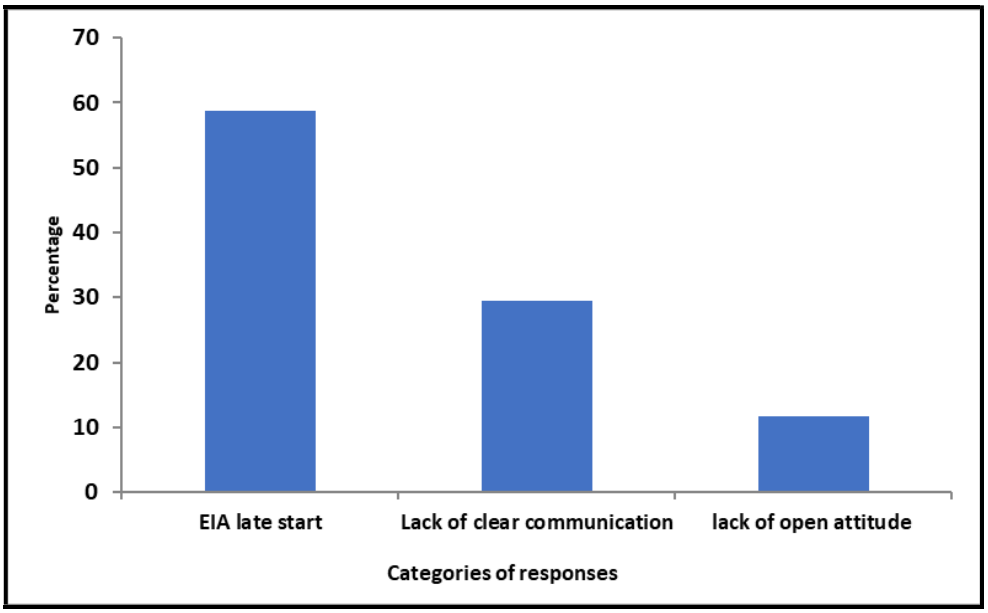

Figure 8.2. The reasons for low effectiveness of EIA

8.1.3 Contextual Factors

According to most interviewees from the first round of interviews, several factors influence the EIA system in Iran. These factors were applied as contextual factors in this research (Khosravi et al., 2018).

8.1.3.1 Legal basis

Legal basis refers to provisions and competences to conduct EIA effectively, and a legal mandate for conducting an EIA study (Gallardo and Bond, 2011). Fischer (2005, p.414) also states that: "*Without formal requirements and provisions, EIA is bound to be "toothless" and highly sensitive to political struggles and power games*".

Sixty three percent of interviewees confirmed that there was insufficient legal basis and inadequate penalties, and that this was the main reason for EIA violations. Therefore, along with other environmental laws, EIA legislation should be clear about what effective penalties are and should be explicit as to how enforcement should happen, as discussed in Chapter 4.

8.1.3.2 Culture of decision-making

EIA systems need to be rooted in the decision-making cultures. Jha- Thakur (2006) states that an EIA system that suits a democratic country might not be suitable for a country with a centralised government (see also Fischer and Gazzola, 2006). The existing distribution of administrative functions shows that Iran can be considered as a centralised country (Dienel et al., 2017), and this has been discussed in Section 3.2.6, in centralised government, the political culture of decision-making is less open and public participation is not necessarily considered positively (Chen, 2013). As mentioned in Chapter 7, two interviewees confirmed that by saying:

> *"The Iranian dominant culture is centralised decision making which hinders the development of public participation culture not only in EIA projects but in all projects planning system."*

8.1.3.3 Political pressure

Interviewees were asked about the role that political pressure plays in Iran's EIA system. All of them believed that the EIA approval process is easily derailed by powerful lobbies in Iran. Twelve out of 20 interviewees said that political pressure greatly affects national projects more than small projects, because politicians believe that these projects are 'strategic' for the development of the country and do not need EIA. Three interviewees mentioned that in some cases, the technical staff of the EIA Commission had opposed approval of the project and/ or even rejected it, but powerful proponents

used their influence to force the approval of politically important projects through. Eight interviewees claimed that political lobbies are also an important factor in EIA offices at provincial level. In some cases, the head of Environmental offices in provinces had struggled to stop legal violation but was hampered by political interventions. Interviewees also mentioned that political pressure had a higher impact on EIA committees at provincial level than at the DoE's national level EIA committees. This was apparent especially in provinces with low levels of economic development where politicians prioritised economic development over the environment.

8.1.3.4 Changing party politics

Table 8.1 compares EIA approvals under Conservative and Moderation Governments and shows that during periods of Conservatives Government, the focus is on economic development. Some interviewees felt that the Conservatives Government (2005-2012) was pragmatic and believed that EIA approval caused delays to necessary development investments. As a result, projects could easily get EIA approval and political pressure greatly affected EIA approval. However, during the following Moderation Government's tenure (2013-2017), political pressure was believed to be less strong over EIA project approval, which became stricter during that period.

Table 8.1. Number of EIAs in 2 different governments in Iran

	2005- 2012 (Conservative Government)	2013-2017 (Moderation Government)
Number of EIA Commissions	877	76
Number of EIAs reviewed by Commissions	1343	257
Number of approved projects	512	66
Number of rejected projects	51	98
Number of projects need revision	314	93

Source: Performance report of the Deputy for Human Environment (2013- 2017), Rahmati 2014

One interviewee stated that changes in government easily affected the Iranian EIA system, saying:

> … *"If we had an explicit EIA-specific law, the change in government could not have had such an impact on the Iranian EIA system."*

8.1.3.5 Organisational capacity

Human capacity: A common weakness of the EIA system that was mentioned by participants was the lack of skilled staff and capacity building. Participants were asked about adequate staff at national and provincial level in EIA administration. Five interviewees stated that the EIA Bureau at national level has 28 staff members, of whom 25 are EIA reviewers. This is not sufficient to handle the number of EIA reports which need to be reviewed. In particular, there is only one staff member in the auditing section and this person said that he oversees the EIA implementation of all projects at random due to a lack of staff availability. Interviewees also stated that lack of auditing in EIA follow-up is related to a lack of human resource in DoE offices at provincial level. One interviewee, from West Azarbayjan' DoE office, stated that there are four experts in the EIA office at this province, which is not sufficient to review all EIA reports and to conduct audits. Interviews at provincial level confirmed the results at national level. They mentioned that the amount of funds allocated to the DoE and EIA authority has a direct effect on the number of staff that can be recruited at national and provincial level. Similar observations have been made in the case of India, where understaffing prevented EIA from being implemented effectively (Jha-Thakur, 2011).

Interviewees confirmed that the EIA Bureau doesn't have sufficiently qualified personnel. Twelve interviewees said the EIA staff needed training, and three interviewees noted that some reviewers were not educated in environmental issues. Some interviewees stated that the experts in the provinces had much weaker EIA knowledge. Five interviewees believed that experts in the EIA Bureau, consultancies and proponents should be trained.

Existence of guidelines: As mentioned earlier, the DoE and UNDP signed a program to establish EIA guidelines for Iran (Khosravi and Jha-Thakur 2018), and these guidelines were published in 2001. Interviewees were asked about the guidelines and all agreed that existing guidelines were too general and largely ineffective. Although one of the EIA Bureau's responsibilities is to update them (Ahmadvand et al., 2009), which has not happened to date. The head of the EIA Bureau stated that

the DoE is currently preparing an update and context-specific guidelines and have contracts with consultancies for 4 types of projects; including dams, landfills, power plants and oil industries.

Openness of EIA actors towards environmental values: Proponents and EIA actors should have an open attitude towards changes to the project's design during the EIA process. When interviewees were asked whether EIA affected project design, some argued that proponents often do not believe in EIA and consequently accept few design changes. The head of the EIA Bureau said that not only proponents, but all levels of Iranian decision-making did not believe in EIA and this explained why they resisted it.

Table 8.2 summarises the main findings of this section with regards to the EIA effectiveness in ULB. The method for judging criterion performance was based on Wood (2003), such that the response to the question "has the criterion been met?" is either "yes", "no", or "partially" (Theophilou et al. 2010).

Table 8.2. Effectiveness of the EIA system in ULB

Criterion	question form of criterion	performance
P1. Scoping	Does EIA consider early participation of stakeholders in the scoping?	O
P2. Cumulative effects	Does EIA consider cumulative impacts of other dams in the basin?	O
P3. Alternatives	Does EIA consider Alternatives of a dam?	O
P4. participation	Are Stakeholders participated during dam's EIA process?	©
P5. Mitigation measures	Are the EIA's conditions implemented? Does the EIA consider the Environmental water right of river?	O
P6. Follow-up implementation	Is EIA Follow-up implemented in water management?	O
S1: Early start	Does EIA initiate at first stages of design to aid decision-making?	O
S2. Decision-making	Does EIA integrate with decision-making and affect project design?	O
S3. Communication	Is there regular communication between EIA team and design team?	O
C1: Legal basis	Is there a clear legal for conducting EA at strategic and project levels	©
C2. Human capacity building	Is there adequate skilled staff for the EIA administration? Openness of EIA actors towards environmental values	©
C3: Culture of decision-making	Does having centralised governments affect effectiveness of EIA?	●
C4: Political pressure	Does the political pressure have affected in EIA approval?	●
C5: Political party government	Does changing government affect the EIA system?	●

Meeting criterion: ● Yes, © partially, O No

8.2 Chapter summary

As discussed in Chapter 1 and 5, the massive dam building and ground water extraction is without doubt one of the anthropogenic factors shaping the catastrophic situation in Urmia Lake (AghaKouchak et al., 2015; Khazaei et al., 2019). This chapter has used a triangulation of document analysis, semi-structured interviews and site visit to examine the effectiveness of EIA in ULB. The existence of only three EIA reports in the basin and only one project with an approval clearly shows that inadequate consideration of environmental effects is not only limited to small dams that have exemption of EIA. There is no EIA in place for large dams that must have EIA based on EIA legislation. The environmental aspects of ULRP, have not been considered. It is evident that to improve environmental consideration in water management, EIAs at project level need to be strengthened. Furthermore, the system needs to incorporate comprehensive assessment tool like SEA that account for the wider implications of extensive dam-building to overcome project reductionism (Agrawal et al., 2010; Grumbine and Pandit; 2013; Erlewein, 2013).

9 Evaluating EIA effectiveness in Iran: Some international comparisons

This chapter discusses the empirical findings obtained in Chapter 7 and 8 and in doing so is divided into five sections. The first section summarises the lack of EA studies in the ULB at project and plan level. The second section explores procedural effectiveness of the EIA in ULB followed by substantive effectiveness in the third section. The fourth section presents a discussion on the contextual factors of Iran which are limiting EIA effectiveness in the country. Conclusions are drawn in the final section.

9.1 Lack of EIA and SEA studies

The existence of only three EIA reports in the ULB and only one project with an EIA approval in its operational phase is an indication of the challenges EIA is facing in the country. Considering the environmental sensitivity of the ULB, it is evident that EIA is currently not effective in providing adequate consideration of environmental effects for dams, mainly because it is not done. Apart from dams, there is also a lack of environmental assessment for groundwater extraction. However, based on international practices, groundwater abstraction has been included in screening thresholds in many other countries. Based on the EU EIA Directive, for example, groundwater abstraction of more than 10 Mm^3 is subject to EIA. Nevertheless, groundwater abstraction or artificial groundwater recharge schemes have not been included in the Iranian screening list and it is fair to say that environmental consideration of groundwater extractions has been ignored within the Iranian water management context.

Some measures proposed by the Urmia Lake Restoration Plan (ULRP) to restore the lake are about inter-basin water transfer. Generally, inter-basin water transfer plans are expensive and time consuming, and at least cannot be considered as a short-term solution. They also cause problems for the water balance and ecosystem of the other basins (Soudi et al., 2017). Water transmission from Zab River to ULB is an example of inter-basin water transfer and Kani Sib dam (the second case study) is one of the main water transfer chains of this transition. Interestingly, the Kani Sib Dam,

which is a part of the ULRP, was constructed before it received EIA approval. Shadkam (2017) evaluated the ULRP measures proposed in her PhD thesis by means of expert opinions. In that study, 40 experts were asked to score the ULRP measures proposed to restore the lake and her findings demonstrated that the large-scale infrastructure interventions, such as inter-basin water transfer, received the lowest rankings for effectiveness based on the experts 'opinion.

Lack of environmental consideration is not only limited to the project level (dams and wells), since environmental aspects of the ULRP have not been considered. Despite the existence of legal requirements for SEA in 5th NDP (Since 2010), no SEA study has been conducted for the ULRP. Based on interviews this is perhaps owing to the lack of skilled resource and capacity needed for conducting SEA studies in Iran. SEA can support strategic-level decisions and should be complemented with EIA at a project level, where a more in-depth analysis is applied with a narrower scope (Ramos et al., 2015). Moreover, the implementation of a SEA has the potential to strengthen EIA and to contribute towards the aims of sustainable development (Jay et al., 2007; Wood 2003). The need for SEA in Iran stems from the fact that the established EIA system considers environmental impacts of individual projects and it is not able to address aspects at sector level and area wide level (UNDP, 2003).

9.2 EIA procedural effectiveness

Findings show that the Iranian EIA system is not procedurally nor substantively effective. As procedural performance is a precondition for substantive performance (Van Doren et al., 2012; Khadka and Shrestha, 2011), the EIA procedural effectiveness' criteria are discussed in this section.

9.2.1 Screening

An effective screening approach must be a hybrid of the threshold and case-by-case approaches (Rajaram and Das, 2011). All interviewees confirmed that the screening in Iran is decided only based on a threshold. Screening has been said to be inadequate by interviewees. Firstly, this threshold does not cover all type of projects, and some types of developments such as urban development

projects, ground water extraction are not in the list. Moreover, the threshold scale may exclude some critical projects. For example, based on the Iranian screening list, only dams with a height above 15m need to be subjected to EIA. However, the question should be whether dams with a height below 15m have significant environmental impact or not. Furthermore, the cumulative impacts of such smaller dams may have a more significant impact than a single large dam (Erlewein, 2013). Exploring the current status of the EIAs in ULB confirms that the existing screening approach is not adequate. Since 34 out of 53 operational dams in the basin are exempted from obligatory EIA, on the basis of the Iranian screening list (For further detail see Chapter 8). As a result, including aspects of a case-by-case approach can be recommended for Iran's EIA screening.

Moreover, groundwater extraction has not been included in the EIA screening list. In this context, Madani (2014) states that the only limiting factors for groundwater withdrawal are well depth and pumping capacity. Once the groundwater table drops, farmers dig deeper and install larger pumps (Foltz, 2002). Some interviewees claimed that the screening list needs to be reviewed and followed on a case-by-case approach, as the current threshold does not allow for some projects to be included. However, they also believed that there is a shortage of human capacity in all provinces, which is in the way of the DoE adopting a case-by-case approach. Therefore, for such an approach to be adopted in the future, the question of capacity building, including both, human aspects and resources need to be given importance.

9.2.2 Scoping

The scoping step determines the significant issues that need to be addressed in the EIA (Snell and Cowell, 2006). EIANZ (2013) mentioned that tighter scoping of EIAs would benefit proponents in terms of cost and time requirements, and also reduce the burden on EIA reviewers. Scoping is a mandatory requirement in some jurisdictions in Europe and even in East Asia, for example, China, Thailand and India (Briffett, 1999; Nadeem and Hameed, 2008). Scoping has been identified as a common weakness in the EIA processes of many countries (Abaza et al., 2004) and they have moved to using generic terms of reference (TOR) for EIA reports. Fischer and Phylip-Jones (2008) state the

purpose of scoping is to identify the important issues to be considered in an EIA. In the UK, scoping is practically implemented through public participation to inform the design process, establish priorities, and outline opportunities for the improvement of the project; the results of this stage are then summarised and publicly notified in specific scoping reports (Bassi et al., 2012).

Based on the findings discussed in Chapter 7, the scoping step in Iran is bypassed by writing EIA reports according to sectoral guidelines, which have not been updated for 20 years. Ahmadvand et al. (2009) and Moradi (2009) confirmed that the scoping is done with the help of EIA Guidelines prepared by the DoE. Results also showed that the understanding of the scoping stage is not coherent in Iran, as 42% of interviewees perceived scoping as merely defining the geographical boundaries for the EIA study. Analysis of the three EIA reports in Chapter 8 also reveal that these EIA reports have similar TOR and shows that scoping is limited to defining geographical boundaries. This is in line with interviewees' responses in the first round of interviews that scoping is bypassed in Iran by using generic TOR for EIA reports. It implies that there is no stakeholder participation at the scoping stage, and developers are not sure about what kind of impacts and issues need to be included in the EIA. Therefore, the scoping stage seems to be neglected within the EIA process. However, understanding of EIA is not just limited with regards to the scoping stage as some interviewees from consultancies had a very poor understanding of scoping, screening and the consideration of alternatives.

9.2.3 Alternatives

Consideration of alternatives should lie at the heart of EIA (Glasson et al., 2012). In spite of its importance, it is inadequately carried out in many countries (Kamijo and Huang, 2016). Weak alternative consideration in EIA process is not an EIA weakness only in developing countries (Kamijo and Huang, 2016), it is considered as a weakness in some mature EIA systems as well. For example, EIA within the UK has frequently been criticised with respect to the lack of assessment of alternatives since there is no formal requirement to assess the alternatives in the UK (Glasson, 1999; Wood et al., 2005; Weston, 2002; Arts et al. 2012; Jha-Thakur and Fischer, 2016). However, the

Netherlands does well with regards to the development of alternatives (Arts et al. 2012). The new EIA directive in Europe (2014/52/EU), which was introduced in 2014, mandated consideration of alternatives. It required at least two alternatives to be assessed including the proposed project (i.e. the preferred option) along with the zero (i.e. no action) alternative.

Inadequacy of the consideration of alternatives was identified as a weakness in the Iranian EIA process by Moradi (2009) and Goldooz (2010). Ahmadvand et al. (2009) clarified that there is no specific requirement to consider alternatives within EIA in Iran. Although, note 2-6 of the 'Iranian EIA directive' mentions that technical and spatial alternatives of projects should be included in the EIA report, it does not make enforcement mandatory. In the first round of interviews, when the interviewees were questioned on the reasons behind not considering e.g. technical and spatial alternatives in EIA process, eleven interviewees stated that EIA is conducted at the latest step of project planning when most of the details have been finalised and there is no opportunity to consider alternatives. Eight interviewees said that even if the projects have spatial alternatives, the final alternative is selected based on economic criteria alone during the feasibility phase. Six interviewees also pointed out that political issues on some projects predetermined the location of the project; that is, projects do not consider any spatial alternatives during the planning process.

During the second round of interviews some participants suggested that EIA studies were conducted only after site selection had already been done. In at least two of the three case studies, this was said to have happened only after the construction phase had already started. This may be due either to political pressure or to the bureaucratic nature of the EIA approval process, which could delay decisions. Therefore, there is no meaningful consideration of alternatives in EIA. Document analysis confirms this claim since Zola dam was built between 2001_ 2010, however, its EIA approval was obtained in 2006. The 5 years delay was attributed to bureaucratic hurdles.

Moreover, most respondents in both rounds of interviews commented that two alternatives, consisting of the proposed project along with the zero alternative are considered in EIA reports, however, this couldn't be confirmed by the document analysis. Barandoz dam's EIA report only

focused on the final alternative. Various technical options of Kani Sib dam are mentioned in first chapter of the EIA report, but the final alternative is said to have been chosen based on the availability of construction material and economic parameters. The same weakness has been repeated in Zola's EIA report and only the preferred alternative has been considered in the EIA study.

9.2.4 Public participation

EIA is unlikely to be effective without engagement with relevant public participation, and especially the participation of stakeholders (Aung, 2017). While there is discussion about the early public participation in EIA systems to make it more effective (Bond et al., 2004), there is no sign of public participation in the Iranian EIA process. Public participation is practically ignored in the Iranian EIA process (Nouri and Nikoomaram, 2005; Moradi, 2009). This was endorsed by 86% of the interviewees in the first round of interview in Chapter 7.

Ahmadvand et al. (2009) confirmed that there is no legal requirement for public participation and some interviewees claimed that absence of a requirement for involving the stakeholders is the main reason for the lack of public participation in the EIA process. However, the absence of requirement couldn't be leading to not having public participation. South Africa has extensive provision for public participation and access to information in the world, but in practise it couldn't be described as a mature democracy (Morrison-Saunders and Retief, 2012).

Analysis of the EIA reports shows there is no evidence of public participation in the three EIA reports which confirms the findings of the first round of interviews. This was also confirmed by most of the interviewees in the second round of interviews. At the provincial level, a public participation office of regional water companies has been established since 2010. Interviewees in West Azarbayjan Water Company said that they were pioneering in the establishment of a public participation office in Provincial Water Companies and this office involves the public in discussion on some dams' operational program involving a local Water Cooperative. This issue was mentioned by some

interviewees in the first round. Therefore, there is some evidence of public participation in Iranian water management, though it is not facilitated through the EIA process.

Such inadequacies in public participation are very similar to many developing countries in Asia and Africa where public participation is rather limited and so doesn't seem to have influence on decision-making (Adomokai and Sheate, 2004; Wood, 2003' Hasan et al. 2018). India, Bangladesh, Sri Lanka, Thailand, Indonesia, Malaysia and Pakistan are further examples of developing countries that lack public participation in their EIA process (Boyle, 1998; Momtaz, 2002; Nadeem and Hameed, 2008; Paliwal, 2006; Zubair, 2001). It is the same in Arab world in countries such as Egypt (Badr 2009), Abu Dhabi (Heaton and Burns 2014) and Bahrain (Naser 2012) where public participation is not seen as a component of their EIA. Although, some countries in the Middle East like Lebanon, Palestine, Jordan and Aqaba have legal requirements for some form of public consultation during the EIA, there are no existing procedures for obtaining feedback and complaints from the public during construction and operation in any of these countries (Bashour, 2016).

According to Tang et al. (2005) and Hasan et al. (2018) the political structure of a country plays a crucial role in ensuring transparency and public involvement in an EIA. Public participation is valued less in countries where the political culture is less open and democratic (Chen, 2013; Purnama, 2003). Iran is administered by central government (Hashemi, 2012) and according to the existing distribution of administrative functions; Iran can be considered a centralised country (Dienel et al., 2017) which hinders the development of public participation culture in the EIA system. Chen confirmed this and stated that in many developing countries the centralised and top-down governance mode is likely to constrain the development of public participation provisions in EIA. According to Hassan et al. (2018) participatory practice in an EIA often faces individual and institutional barriers. Illiteracy, lack of knowledge, and passive attitudes are some of the individual barriers while institutional barriers include limited or no access to EIA reports and lack of transparency.

Two interviewees claimed that the low-level of environmental awareness in the public can constrain effective public participation and in turn dilute the effect of public participation. The influence of a low level of public awareness as a barrier on effective public participation in an EIA system has been affirmed by other authors (Chen, 2013). Moreover, result of Interviews and document analysis confirm that EIA reports are treated as confidential documents in Iran and the public do not have access to them. This means there is no transparency in the Iranian EIA process and this lack of transparency is contrary to arguments that a transparent and clear process is the basis for effective participation and involvement within EIA (Fischer, 2005). Nevertheless, public participation is a key component of EIA, not just in some systems but everywhere (see e.g. Nadeem and Fischer, 2011). Therefore, this will need to be addressed in Iran. However, improving public participation in the process can enhance transparency within the EIA system (Marara et al., 2011).

9.2.5 EIA Follow-up

Glasson et al. (2012) state, monitoring and inspection of project implementation following approval are often absent from the EIA process, which was evident in Iran (Ghodoosi et al., 2006; Moradi, 2009) as all interviewees in both rounds of interviews confirmed that follow-up practice is very limited in Iran.

Auditing is a part of EIA follow-up (Jha-Thakur et al., 2009; Jones and Fischer, 2016). The interview participants were also asked about the auditing in the EIA process. They all claimed that auditing is very weak, and it was conducted at random due to a shortage of personnel in the DoE and the provincial body. The inspection officer in the DoE stated that the serious lack of personnel in Tehran and all provinces meant it was not possible to oversee whether the developer has implemented monitoring. Interviewees from the provinces in the second round of interviews confirmed the claim that lack of resources limits auditing. Limited organisational resources allocated by the authorizing agency is a common barrier for EIA follow-up implementation in developing countries (Arts et al. 2003; Bashour, 2016). Most interviewees also argued that the lack of adequate legislation, penalties and enforcement are the other reasons for this weakness. This is, however, frequently observed

elsewhere, too. For example, EU Directive 85/337/EEC and amendment Directive 97/11/EC that form the basis for EIA legislation makes no provision for monitoring. However, some countries have enacted formal legislation for EIA, in the form of regulations. For example, in the Netherlands' EIA regulation there is a requirement for follow-up, in contrast to the UK; so, EIA effectiveness in the Netherlands in this regard should therefore be greater than in the UK (Arts et al., 2012).

Braniš and Christopoulos (2005) evaluated the Czech EIA system and follow-up provisions and concluded that the Czech government had legislated for monitoring impacts through the EIA act in 1992. However, monitoring programmes were not implemented due to the costs to the developer and lack of institutional support such as guidance or available expert knowledge (Jones and Fischer, 2016). Jones and Fischer (2016) investigated the main barriers of EIA follow-up in the UK. They concluded that there are three main barriers to follow-up practices in the UK; lack of appropriate legislation, implementation costs, and lack of enforcement. They found that legal requirement doesn't guarantee follow-up implementation, even if adequate enforcement measures are taken. Other barriers will still be valid even if legislation is present.

The quality of the EIA reports is one of the main preconditions for effective follow-up (Jha-Thakur et al., 2009; Jones and Fischer, 2016). Based on Jha-Thakur et al. (2009) a follow-up design needs to determine roles and responsibilities, scope of follow-up issues and methodologies for follow-up programmes. Document analysis of three EIA reports shows that EIA follow-up design has not been considered properly. For example, allocation of tasks, roles and responsibilities between stakeholders is not clear. The three EIA reports have failed to explain how monitoring should be done.

9.2.6 Consideration of cumulative effects

Interviews and document analysis confirm that cumulative effects from the operation of several dams along the same stream are not addressed in EIA reports. Moreover, it was claimed that cumulative impact is not considered in the Iranian EIA process. In this regard some participants suggested that SEA could play an important role in closing the gap regarding cumulative and basin

effect of extensive dam building. It is fair to say that SEA has the potential to address the urgent problem of cumulative impact (Dixon and Thérivel, 2011; Harriman and Noble, 2008). SEA itself is not a practical tool for reviewing specific cumulative impacts in detail, but it provides an entry point for making cumulative impact assessments (CIA) an integral part of basin plans (Erlewein, 2013). Effective SEA could contribute effectively by proactively considering the cumulative effects of multiple projects and large-scale dam policies along with synergistic effects of developments beyond damming. This will help in avoiding such disasters in ULB and other basins (Khosravi et al., 2018).

9.3 EIA substantive effectiveness

Our findings show that the Iranian EIA system is not substantively effective. An EIA system can be considered effective when it integrates impact assessment into a course of action (Rozema and Bond, 2015). "*The difference between what would happen with the action and what would happen without it*" (IAIA, 2009: 1; Rozema and Bond, 2015). All participants confirmed that the EIA in Iran has had a very limited influence on decision-making due to the late start of EIA, lack of coordination, and lack of open attitude. However, the discussion in Chapter 7 shows that another main reason of Iran's EIA limited influence is EIA non-application. Existence of only three dams' EIA report in ULB shows that EIA is not applied making it substantively ineffective. Therefore, non-application of EIA is another reason of not being EIA effectiveness substantive.

There is lack of clear communication between the proponent and consultant to make them aware of how decisions are made. Communication between the proponent and the consultant was not clear and hence a holistic understanding of the decision-making process is lacking. However, lack of coordination is an important factor which causes delay in effective and sustainable decision-making (Wayakone and Makoto, 2012). Lack of coordination has also been seen amongst different ministries. This is demonstrated by interviewees revealing that the MoE commences dam construction without EIA approval while it has an approved budget to build the dam. However, inadequate co-ordination between environmental ministries and development ministries, hampers the integration of environmental considerations (Lee and George, 2013). Therefore, good

coordination among proponents and the financial institutions providing the funding can also help in ensuring that no project likely to have adverse environmental impacts could be launched before securing EIA approval.

9.4 The role of contextual factors in Iran's EIA effectiveness

The literature suggests that the substantive effectiveness of EIA is context-specific (Arts et al., 2012; Fischer, 2005; Fischer and Gazzola, 2006; Runhaar and Driessen, 2007; Hilding-Rydevik and Bjarnadóttir, 2007; Zhang et al., 2013) and mostly the positive values that an EIA brings to the decision-making process are not well recognised due to numerous contextual factors that influence how EIA makes an impact on decision-making (Zhang et al., 2013). Our evaluation also shows that contextual factors to some extent affect the effectiveness of Iran's EIA system. This section provided a complete explanation on how these contextual factors influence Iran's EIA system.

9.4.1 EIA legal basis

EIA legislation has been discussed as an important contextual factor that affects EIA effectiveness (Fischer, 2005; Arts et al., 2012). In a survey about EIA effectiveness in the Netherlands and the UK, participants were asked about the most important factors for effective EIA. In both countries, most of the respondents considered complying with legal requirements as the most important reason for environmental behaviour of proponents and authorities, meaning EIAs are conducted because EIA is mandatory, not because actors want to achieve more environmentally sustainable outcomes with the help of EIA (Arts et al., 2013). Furthermore, in South Africa, Craigie et al. (2009) found that only 15% of those involved in EIA act on the respective law because they believe in it, but 70% for fear of litigation. Hence, a clear legal mandate is essential for conducting an EIA study (Gallardo and Bond, 2011).

In some countries, an EIA provision is integral to general environmental law rather than standing alone (Sadler,1996; Woods, 2003). However, based on literature presented in Chapter 6, the Iranian EIA legislation is not part of any law but part of the National Development Plan (NDP). Interviewees

confirmed lack of sufficient legal basis and also inadequate penalties were the main reasons for EIA violations. In this context, Bashour (2016) has compared the EIA legislations of Lebanon, Palestine, Jordan and Aqaba and found they differ in terms of setting fines and penalties for EIA non-compliance. Lebanon's Environmental Protection Law stipulates a penalty of up to US$132,000 or a year in prison for proceeding a project without EIA approval (GOL, 2002). The remaining countries don't specifically address this issue. However, they have specific fines for activities that cause pollution and environmental degradations (Bashour, 2016). EIA law in Turkey is also part of Environment Law, however, Article 20 of this law is about imposing administrative fines for violators. According to the Article "Those who start construction or projects that come into operation before EIA process starts or ends shall be imposed an administrative fine of 2% of the project cost". Moreover, the investor is obliged to restore the site to its previous state (Elvan, 2018). It is reasonable to conclude that EIA legislation is a weakness for EIA in Iran and it lacks sufficient penalties for failing to carry out an EIA. As a result, with any laws for environmental issues, legislation needs to provide for penalties to ensure enforcement that include criminal sanction, civil sanction, and administrative sanction (Heidari et al., 2017). Thus, regulators in Iran need to revise national EIA regulation to address the lack of adequate penalties for EIA violations and also provide other requirements to implement the penalties.

As discussed, Iran lacks a strong legal foundation to provide back up for taking stern action against violators of EIA requirements and EIA implementation. Therefore, new legislation for EIA in Iran would be a key condition for effective EIA. Furthermore, clarity is required with regards to what effective penalties are and how they should be enforced (Effective penalty in EIA legislation was discussed in section 8.1.1). To deal with EIA violations, some countries like Kenya have an independent judiciary body to specifically deal with any litigation that might arise between the developer and the EIA Authority (Marara et al., 2011). While there is currently strong call to reform the legal basis for EIA in Iran, this change does not guarantee the improvement in Iran's EIA system.

Nadeem and Hameed (2008) also claimed that despite a sound legal basis and comprehensive guidelines in Pakistan, Pakistan's EIA has not yet evolved satisfactorily. According to EIA Handbook for Pakistan (2014), the provincial Agency has the power to impose administrative penalties for violation in implementation of EIA conditions, but these penalty provisions have not been used, due to the lack of rules and procedures to impose them (Fischer et al. 2014.). South Africa has a mature and well-established EIA system that is comparable with good practices elsewhere in the world (e.g. Lee and George, 2000; Wood, 2003; Morrison-Saunders and Retief, 2012). South Africa's EIA system is based on sound legal content, but application is generally lacking. It means simply defining EIA and sustainability in legislation does not ensure success in practice (Morrison-Saunders and Retief, 2012). Sandham et al. (2013) analysed whether restructuring of the South African EIA regulation (2006) could improve quality of EIA practice. They concluded that regulatory change has not brought about improvement in practice and EIA reports' quality. Other supportive elements such as training the EIA stakeholders, improving guidance and continuing research really pave the way in enhancing EIA practice. As a result, other contextual factors like capacity building are as important as new EIA regulation.

Iran is currently still 'learning about EIA' rather than learning about how to enhance environmental protection through EIA implementation (Khosravi et al., 2019a; Khosravi et al., 2019b). Thus, prioritizing capacity building is urgently needed. It is vital to develop capacity for actors involved in EIA, including DoE staff, consultants, developers, NGOs and universities to improve EIA stages such as screening, scoping, EIA reviewing, monitoring and inspection. Another weakness relevant to capacity building in the Iranian EIA system is guidance documents which the DoE has failed to update. The existing guidelines are sectoral; however, it is important that the DoE provides guidelines relating to screening, scoping, public participation and reviewing reports. Many of the shortcomings discussed above are common within a developing country context (Kolhoff et. Al., 2009). El-Fadl and El-Fadel (2004) report that most deficiencies in the practice of EIA in MENA (Middle East and North Africa) countries arise from the poor context including availability of

guidelines, weak local expertise, limited training and capacity building initiatives (Marara et al. 2011).

EIA capacity building has been reported by many authors as the main weakness to implement EIA effectively in developing countries (Kirchhoff 2006; Kolhof et al., 2018). While, they consider it as a synonym for training (Potter and Brough, 2004; Kirchhoff 2006; van Loon et al., 2010) and recommend it as a possible solution to improve the system. However, capacity building is a broad concept including various sub capacities and training is a key piece that can make the success of any system (Partidário, 2005) but this does not mean that other components of capacity building shouldn't be considered (Kirchhoff 2006).

9.4.2 EIA human capacity

Literature review reveals that there is a weakness of understaffing in Iranian EIA administration (Ahmadvand et al., 2009; Goldooz, 2010; Khosravi et al., 2019a; Khosravi et al., 2019b). Participants were asked about adequate staff at national and provincial levels in EIA administrations. Interviewees stated that lack of auditing in EIA follow-up is related to lack of staff in the DoE at national and provincial levels. This was concluded during the first and second round of interviews. One interviewee, from west Azerbaijan's DoE office, stated that there are four experts in the EIA office of this province, which is not enough to review all EIA reports and to conduct auditing. He mentioned that the amount of funds allocated to the DoE and the EIA authority has a direct effect on the number of staff that can be recruited at national and provincial levels.

Apart from being understaffed at national and provincial level, Ahmadvand et al. (2009) and Moradi (2009) believe that some of the staff in the EIA Bureau are not sufficiently professionally qualified for their role. This was endorsed by twelve interviewees during the first round of interview. The results of interviews revealed that poor understanding of EIA is not just limited to EIA Bureau staff and some interviewees, from consultancies and even universities, had a very poor understanding of some steps of process such as scoping, screening and the consideration of alternatives. Referring to the categories developed by Jha-Thakur et al. (2009a) on 'learning in appraisal', Iran's development

of EIA is still at a low level. This can be said 'to be learning about EIA' (p,135) i.e. in terms of understanding EIA legal requirements and procedure that is yet to be achieved in the Iranian EIA system. Currently, many involved in EIA are still 'learning about' the instrument, rather than advancing their knowledge on project impacts with EIA. This finding in itself is not concerning since even in developed countries with matured EIA system, some lower level learning continues to happen (Jha-Thakur and Fischer, 2016; Weston, 2002). Kirchhoff (2006) believes that for EIA to work effectively and beyond the 'learning about the instrument' stage, appropriate skills are needed within government departments, the developers, EIA consultants, academics and NGOs. Training and education are needed for developing skills for EIA good practice (Jha-Thakur et al., 2009b) and are some of the main factors for human capacity building (Kirchhoff, 2006). This capacity building needs to start with the EIA authority in EIA Bureau as they perform quality control by reviewing EIA documents. In this regard, Sanchez and Morrison-Saunders (2011) state that 'EIA agencies can be framed as learning organisations (Argyris and Schön, 1996) and their staff as knowledge workers (Davenport, 2005). Furthermore, with regards to EIA capacity building in the Iranian EIA administration, workload capacity and inadequate staff numbers are important factors which were mentioned by most interviewees.

Glasson and Salvador (2000) have searched about the EIA institutional framework for EIA in Brazil and mentioned that it is too centralised to state level. They have seen it as one of the main weaknesses of the EIA system that could influence its effectiveness. EIA centralisation has been considered as a sub criterion to evaluate the Iranian EIA administration in Chapter 7 and the finding reveals that the Iranian EIA institutional framework is highly centralised at the national level. The head of the EIA Bureau confirmed this and stated that, to resolve this problem, the EIA Bureau had formed provincial EIA Commissions in provinces in 2013 to give local organisations an opportunity to participate in the EIA process. In doing so, 20 types of projects have recently been delegated to provincial EIA committees for review and for reaching final decisions. However, insufficiently qualified personnel can be a greater issue at provincial level which affects decision-making. This has been observed in India where decentralisation itself has not helped in enhancing EIA efficiency

(Paliwal and Srivastava, 2012). Human capacity building is a premier factor for EIA administrator decentralisation. Therefore, before re-defining roles and delegating EIA decision-making responsibility, a development of provincial human capacity is needed.

The other weakness mentioned by all interviewees was that existing guidelines were too general and ineffective. These guidelines were published in 2001 by the DoE and it is the EIA Bureau's responsibility to update them, which has not happened to date (Ahmadvand et al., 2009). The head of the EIA Bureau stated that the DoE is currently preparing an update and context specific guidelines and has associated contracts with consultancies for 4 types of projects, including dams, landfills, power plants and oil industries.

9.4.3 Political pressure

Political pressure as a contextual factor that can derail the EIA approval process in Iran. Interviews and document analysis also confirm that the EIA reports are treated as a tool to gain approval but once the approval is granted its value diminishes. In some cases, political pressure has even had enough power to prevent water authorities from preparing EIA reports. Fischer (2005) believes the EIA authority needs to be given some power to avoid situations in which other organisations can put too much pressure on them.

Iranian politicians generally consider autonomous environmental authorities as barriers to economic growth, meaning no political will to support EIA and the EIA approval process is easily derailed by powerful lobbies in Iran. This is not unique to Iran, as developing environmental authorities' capacities does not rank high on the political agenda of many countries (UNEP, 2004; Kolhoff et al., 2012). Bragagnolo et al. (2017) discuss the role of politicians in Brazilian EIA system since some politicians and lobbyists view EIA procedures as too time consuming, overly bureaucratic and a major barrier to economic development (World Bank, 2008). Marara et al. (2011) compared the importance of context in delivering effective EIA in Tanzania, Kenya and Rwanda. They concluded that while political will for the inclusion of environmental issues is high in Rwanda, it is rather low for

the case of Kenya and Tanzania and 50% of respondents cited political will as barrier to EIA effectiveness.

The effect of political issues on an EIA system is not limited to developing countries and it could affect mature EIA systems as well. The role of the government and political party is also important in the development of EIA. For example, Fischer et al. (2015, p:7) state: "The current Conservative-Liberal Democrat government is not showing any interest in the development of EIA and SEA. As a consequence, guidance documents have not been updated for many years and there have not been any initiatives on any related aspects, neither the support of research, nor the development of inventories, advice or capacity building activities". While the former Labour Government in 1999 was an opportunity for EIA in the UK, the Conservative Government is clearly a threat to the EIA system (Jha-Thakur and Fischer, 2016).

Therefore, the willingness and characteristics of the actors involved in EIA are perceived to be a very important factor of EIA effectiveness. A survey about the EIA effectiveness of the Danish system indicated that 81% of the respondents stated that the willingness of the proponent and the competent authority to take environmental values into account was of high or very high importance for the substantive effectiveness of EIA (Lyhne et al., 2017). As mentioned, when interviewees were asked whether EIA affected project design, some argued that proponents often do not believe in EIA and consequently accept few design changes. The head of the EIA Bureau said that not only proponents, but all levels of Iranian decision-making did not believe in EIA and this explained why they resisted it.

9.4.4 Culture of decision making

The dominant decision-making culture in Iran is centralised and this hinders some elements of an EIA system such as public participation (Khosravi et al., 2019b). This is why public participation has been marked as one of the weakest links in the Iranian EIA system (Khosravi et al. 2018). Public participation is valued less in countries where the political culture is less open and democratic (Chen, 2013; Purnama, 2003). The development of public participation provisions in EIA legislation is

influenced by a country's political culture of decision-making (Chen 2013). Legal requirements do not have to be the main driver for public participation, in practice. Their absence, though, can be interpreted as a sign of an immature democracy (Morrison-Saunders and Retief 2012; Khosravi et al., 2019b). Lack of public participation provision, which is influenced by the Iranian culture of decision-making, has been mentioned as one of the most important reasons behind its absence in the EIA process.

9.5 Chapter summary

Results of examining the EIA effectiveness in ULB in Chapter 8 revealed that EIA in Iranian water management is neither procedurally nor substantially effective, as it is not able to address and mitigate the larger effect of extensive dam-building. Discussion and comparison of findings with international literature show that Iran's EIA is facing several problems. These include insufficient EIA legal basis, deficiencies in screening, scoping, public participation, alternative consideration, and EIA follow-up. Lack of consideration of cumulative impacts in the Iranian EIA process indicates an urgent need for SEA which goes beyond the level of individual projects. In this context, SEA can play a major role with regards to cumulative and basin effects that are currently not addressed in EIA studies. Discussion also shows that EIA in Iran has had a very limited influence on decision-making due to specific contextual factors in the country that include: the legal basis, culture of decision making, political pressure, and human capacity. EIA in Iran does not have a strong and explicit mandate and EIA legislation needs to become stronger, along with clearer defined roles and responsibilities of stakeholders, which should go a long way in enhancing EIA effectiveness in Iran. Moreover, some of the major deficiencies in Iran's EIA system relate to weak EIA human capacity in Iran. For example, there is very poor understanding of some stages of EIA that affects procedural effectiveness. The lack of auditing by the DoE influences EIA implementation and discourages developers to commit to EIA mitigation measurement and monitoring. Lack of auditing in EIA follow-up is related to the lack of human capacity in the DoE offices at national and provincial levels. Therefore, the next chapter provides some recommendations to improve the Iranian EIA system.

10 Recommendations to improve EIA system in Iran

This chapter is divided into three main sections. Initial recommendations based on results of the evaluation of procedural and substantive effectiveness are provided in first section. Followed by assessing the feasibility of these recommendations based on contextual factors and stakeholder perceptions, which eventually helps in formulating the final recommendations. The third section provides feasible recommendations to improve EIA effectiveness in Iran. This chapter answer the fourth objective of this research, which is "*to develop recommendations to enhance effectiveness of EIA in Iran and assess the feasibility of implementing these recommendations with considering Iran's contextual factors*."

10.1 Initial Recommendations for Improving EIA in Iran

The purpose of this section is providing recommendations to enhance Iran's EIA effectiveness based on the results of Chapter 7, and 8.

10.1.1 Initial recommendation to combat procedural inefficiency of EIA in Iran

The components of the Iranian EIA system evaluated in Chapter 7 revealed that EIA in Iran currently experiences several problems. Procedural and substantial effectiveness of EIA in the ULB was evaluated in Chapter 8. The findings highlighted several drawbacks within the Iranian EIA system, making it procedurally and substantially ineffective. Some initial recommendations have been provided in this section based on the gaps identified in the evaluation of Iran's EIA system. Procedural performance is a precondition for substantive performance (Van Doren et al., 2012; Khadka and Shrestha, 2011). Accordingly, the following section first outlines recommendations for enhancing procedural criteria.

10.1.1.1 Strengthening Iranian EIA legislation: There is a correlation between procedural performance and clarity of EIA legislation (Kolhoff et al. 2016). As discussed in Chapter 7, the existing EIA legal basis (as an article of the NDP) is not strong enough for effective action against EIA offenders. Therefore, strong legislation is needed in an attempt to improve EIA effectiveness in

Iran. Furthermore, regulators in Iran need to revise national EIA regulation to address the lack of adequate penalties for EIA violations.

EIA bill is now pending, therefore, the role of parliament in passing the EIA regulation is key towards having an EIA specific law. The new parliamentary law needs to include penalties in case of non-compliance with the EIA Act and other specified clauses of the Act. These fines should be high enough to deter potential violators and should lead to suspension of the developmental activity. Such fines are currently included in some EIA legislations (Reid 2013; Bashour 2016). EIA law needs to be clear with regards to what effective penalties are and should be explicit as to how enforcement should happen. The new EIA legislation should be SEA inclusive, and also contain mandatory requirements for scoping, public involvement, alternative consideration, and follow-up.

Case by Case Approach for Screening: There is an urgent need to review the threshold as some projects like urban development, large housing schemes, and ground water extractions have not been included in the list of projects requiring an EIA. Including aspects of a case-by-case approach can be recommended for Iran's EIA screening. However, for such an approach to be adopted in the future, the question of human capacity and resources needs to be given importance. Providing the screening guidelines is also recommended. For example, In India, Under EIA Notification of 1994, screening guidelines were issued for four categories of activities: Industry, Mining, Thermal Power, River Valley and Hydroelectric and Infrastructure (Rajaram and Das, 2011).

Guideline for Scoping: As discussed in section 9.4.2, Iranian EIA actors had a poor understanding of some stages of EIA. Therefore, training is needed to develop understanding of the stages of EIA. For example the purpose of scoping in the EIA process was not clear. Providing guidelines for scoping is recommended to implement scoping stage effectively. Nadeem and Hameed mention in their research that the basis of determining the scope of EIA in Pakistan is derived from the sectoral guidelines and these sectoral guidelines are available for projects belonging to various development sectors (GoP, 1997b). The new EIA act should therefore also contain a mandatory requirement for scoping.

Making Public participation mandatory: The new EIA legislation should contain a mandatory requirement for Public participation. However, increasing stakeholders' awareness about potential environmental and socio-economic impacts of projects is a requirement for public participation. NGOs and media are playing a leading role regarding public awareness. Guidelines also need to be provided by Iran's DoE for public consultation. It is compulsory to engage the relevant stakeholders from the 'scoping' stage of the EIA process to include public and stakeholders' concerns in EIA. While many interviews had poor understand of the public participation's rationale and how they could involve in the EIA process, providing guidelines could be vital as a part of capacity building.

Enhancing Follow-up: EIA follow-up needs legislation, enforcement, and institutional capacity (Guidelines and expert knowledge) as requirements (Jone and Fischer, 2016). Thus, the new EIA legislation should contain a mandatory requirement for the EIA follow-up. The DoE should be adequately financed with staff at national and provinces level to enhance the implementation of EIA follow-up. This can be achieved either by securing funding from government or by imposing follow-up fees on the project proponent under the principle of polluter pays. Besides, more autonomy in the form of minimum political interference and involvement of local communities shall also be needed to ensure better compliance with the conditions of EIA approval and follow-up (Nadeem and Hameed, 2008).

Consideration of Cumulative Impacts: The MoE needs to prepare a cumulative impact assessment (CIA) related to dam construction. Cumulative impact assessment is a technique designed to assess the combined environmental effects of multiple activities. The CIA findings would help in the overall environmental management aspects of dam construction.

10.1.2 Initial recommendation to combat substantive inefficiency of EIA in Iran

Apart from procedural performance, there are some other deficiencies which affect Iranian substantive effectiveness which have not been discussed in the procedural effectiveness section, including:

Coordination: Interagency, inter-sectoral or regional is crucial for an effective EIA system (Nadeem and Hameed, 2008). Weak coordination between lead agencies was found to be very poor In Iran's EIA system. Good coordination among proponents/ consultants/ the DoE and MPO (Iran's financial institution) in consideration of their concern and also stopping EIA violation before construction is necessary.

EIA decentralisation: The effective participation of the local planning authorities could be fundamental, but unfortunately in most Iranian provinces there are no human and material conditions to achieve this. Therefore, Capacity building is also a premier factor for EIA administrator decentralisation. The Iranian EIA system has recently considered decentralisation of EIA administration by delegating 20 types of project to provincial EIA committees to review and make final decision. However, insufficiently qualified personnel can be a greater issue at provincial level which affects decision-making. Therefore, before re-defining roles and delegating EIA decision-making responsibility, a development of human capacity at provincial level is needed.

Strengthening EIA human capacity: The EIA offices of the DoE should be given more administrative powers and autonomy to impose fines or halt any project violating EIA requirements. In this regards, adequately qualified staff and equipment are particularly required for inspection and enforcement activities. Moreover, as discussed, Iran is currently still 'learning about EIA' rather than learning through EIA to enhance environmental protection through EIA implementation. Thus, prioritizing training is urgently needed. It is vital to develop capacity for actors involved in EIA, including DoE staff, consultants, developers, NGOs and academics to increase understanding of EIA stages such as screening, scoping, EIA reviewing and follow-up by providing EIA training and guidance documents. One solution is offered by Weston (2011), who suggests that all planning courses in universities need to include EIA as a part of their programmes, and continuous professional development courses should be on offer throughout the country on an almost continuous basis. The DoE needs to provide training related to EIA for the EIA authority in national and provincial departments.

10.1.3 Initial Recommendations to improve environmental consideration at plan level

Discussion in Chapter 9 revealed there is a dire need to improve environmental consideration in water management at both project and plan level. Recommendations with regards to strengthening EIAs at project level have been presented in previous sections, however, the role of environmental consideration at the plan level (SEA) on ULB is more important because individual EIAs will never be enough to address the cumulative impact on the whole basin. SEA can support strategic-level decisions and complement with EIA at a project level (Ramos et al., 2015) and the implementation of a SEA has the potential to strengthen EIA and to contribute towards the aims of sustainable development (Jay et al., 2007). This is especially required in Iran's water management system where EIA is not effective. The need for SEA in Iran is vital regarding the weakness of EIA at project level. The first movement in the field of SEA in Iran started in 2005 with the project 'capacity building programmes on SEA' and SEA was first mentioned in the 5th NDP in 2010 (Khosravi and Jha-Thakur, 2018). Despite this, SEA has not been undertaken in Iran and lack of capacity and understanding have been noted as the main reasons (Khosravi et al. 2019). Hence, the DoE needs to launch capacity development for SEA and SEA implementation should start with a specific sector (such as water sector).

10.2 Assessing the feasibility of recommendations based on Iran's contextual factors

Many recommendations are transplanted from Western democratic countries to developing countries without considering their feasibility in the light of the changed context (Kolhoff et al. 2009). For example, A strong EIA legislative framework is a common recommendation offered by many scholars (Fischer and Gazzola 2006; Badr 2009; Khosravi et al. 2018; Khosravi et al. 2019; Wayakone and Makoto 2012). However, Kolhoff et al (2013) state that the key actors' (e.g. parliaments and the sector ministries) capacities as well as contextual factors such as the political system and economic situation are the most important factors, determining the development of EIA legislation in a country. They also argue that there is a relationship between the vision of the sector ministries and the parliament on the role of the environment for the socio-economic development

of the country and the development of EIA legislation (Kolhoff et al. 2013). Therefore, this section assesses the feasibility of implementing recommendations to enhance Iran's EIA effectiveness by tailoring these to the country's contextual factors. In doing so, typical recommendations for EIA improvement were identified in literature and in previous sections. These were used to develop a framework of analysis that is described in Table 2.9. The typical recommendations can be broadly categorised under four headings which include a) EIA regulations b) public participation c) capacity building and d) follow-up. However, specific idiosyncrasies of the system are usually ignored in such generic recommendations (Kolhoff et al. 2009). As explained in Chapter 2, in order to consider the Iranian contextual factors, ten interviewees were selected from the previous set of interviews on the basis of their seniority, knowledge and experience of Iran's EIA system and its context. These interviewees participated in further interviews with regards to considering feasibility of the recommendations.

This section presents findings from the provided framework of analysis and is therefore organised accordingly. Findings are compared to literature, and any improvement suggestions offered by the interviewees are included in the results.

10.2.1 Enhancing EIA legislation in Iran

Considerable number of projects proceed without EIA approval in Iran (Khosravi et al. 2019). Lack of strong EIA legislation with penalty code is reported as one of the main reasons of starting projects without EIA approval. Thus, new legislation with clear penalties for EIA in Iran was suggested as a key condition for effective EIA (Khosravi et al. 2018). Interviewees were asked about the possibility of improving Iran's EIA legislation. All interviewees confirmed that there is a need for explicit legislation, but they believed this is not practically possible as there is no political will on the part of parliamentarians and sector ministers to introduce such EIA law. These interviewees recalled a previous attempt to create EIA-specific legislation in 2014 with the help of previous government departments, including the Ministers of Cabinet and Iran's DoE. The draft EIA bill was prepared by the EIA authority and consisted of 5 chapters, with the 5th chapter addressing penalties. However, it

was minimised by sector ministries, represented by the Cabinet of Ministers. The minimised EIA bill was then submitted to Parliament, but it was rejected by parliamentarians. One interviewee claimed: "*Iranian parliamentarians' mindset is on economic development and believe that environment cause delays to development investments. There is no hope of having EIA legislation with this way of thinking about the environment*". Another concurred and stated that: "*Although EIA Act is the fundamental recommendation to improve Iran's EIA system, considering current political context and the way of thinking about environment, it is not a practical and feasible recommendation".* One interviewee said that *"EIA legislation is the small building block and even if Iran's parliament pass this bill, it is not able to do anything itself and the most important item is training and capacity building.*"

Kolhoff et al. (2013) argued that there is a relationship between the vision of the sector ministries and parliament on the development of EIA legislation. Several interviewees supported this thinking within the Iranian context. They were of the opinion that, in addition to other contextual factors, the two key groups of national actors (Members of Parliament and the Cabinet of Ministries) are so influential that the EIA bill would not pass the parliamentary stage. Their reasoning was that these actors are focused on economic development and believe that environment causes delays to development investments. Kolhoff et al. concluded the level of environmental awareness within the sector ministries and parliament is a primary driver of EIA legislation development. However, only having a strong EIA legislation is not a guarantee to success in EIA practice (Morrison-Saunders and Retief, 2012). According to Sandham et al. (2013), South Africa's EIA system restructured its legal basis in 2006 and now it has a sound legal basis, but application is generally lacking. They researched whether EIA quality improved after the major restructuring of the EIA regulations, and found that EIA quality had not changed. Hence, they suggested that improvements should be sought in other ways, including accreditation, training of EIA actors and improved guidance on good practice. Their findings were echoed by some Iranian interviewees, and one claimed that EIA legislation is just a small building block and it would be unable to do anything itself. This interviewee felt training and capacity building were more important.

10.2.2 Improving Iran's EIA effectiveness through capacity building

Kirchhoff (2006) and Kolhof et al. (2018) saw capacity building are the most important mechanism for improving EIA implementation in developing countries. Most interviewees were of the opinion that capacity building is a more urgent requirement than EIA legislation. Three interviewees also felt that this should start within the EIA Bureau as that body crucially controls quality by reviewing EIA reports. Khosravi et al., (2018) also concluded that EIA capacity building is urgently needed to improve Iran's EIA system. The literature review confirms that some of the staff in the EIA Bureau were not sufficiently qualified for their role (Ahmadvand et al., 2009; Moradi 2009; Khosravi et al 2018). Careful questioning revealed a blurred understanding of some steps of the EIA process amongst most EIA actors (Khosravi et al., 2019). Kirchhoff (2006) concluded that appropriate skills are needed not just within the EIA authority, but also within government departments, developers, EIA consultants, academics and NGOs.

All interviewees were of the opinion that Iran's DoE and the EIA Bureau need to start with capacity building rather than excessively focus on EIA legislation. Their rationale was that they believed parliament was unlikely to approve any Bill and that improvement should be explored elsewhere. Capacity building was seen as one of the most feasible ways to do this. The findings show that there is still a dire need for improved capacity to implement EIA process in Iran, despite twenty-five years having passed since EIA emerged in the country. Iran's EIA development can be assessed as still being at a low level in terms of the categories developed by Jha-Thakur et al. (2009), such as 'learning in appraisal'.

As previously discussed, interviewees believed capacity building should start within the EIA Bureau, and that improved quality control will force EIA consultancies and practitioners to work harder to achieve the necessary standards. Literature supports this recommendation, with Sanchez and Morrison-Saunders (2011) saying that "*EIA agencies can be framed as learning organisations*" (Argyris and Schön, 1996; Sanchez and Morrison-Saunders 2011) and their staff as knowledge workers (Davenport, 2005; Sanchez and Morrison-Saunders 2011).

Efforts may start with the EIA Bureau, but the broader requirement should not be ignored. Weaver et al., (2008) emphasise the role of EIA practitioners as "*pushing the vectors*" of sustainability, and Bond et al., (2010, p. 6) argue that "*sustainability outcomes in EIA*" call for a "learning organisation approach". Whilst EIA agencies may play a central role (Sanchez and Morrison-Saunders 2011), the broader set of actors identified by Kirchhoff (2006) also need appropriate skills. One solution is offered by Weston (2011), who suggests that all planning courses in universities need to include EIA as a part of their programmes, and continuous professional development courses should be on offer throughout the country on an almost continuous basis.

10.2.3 Initiating public participation in Iran

Public participation has two primary benefits; it helps introduce procedural democracy (Aschemann, 2007; Panigrahi and Amirapu; 2012) and public pressure is a form of EIA quality control (Bond et al., 2017). However, public participation cannot effectively work without embedding a culture of public participation into society (Purnama, 2003; Marara et al. 2011).

Internationally, there is opinion that the political structure of a country plays a crucial role in public involvement in an EIA (Tang et al., 2005; Hasan et al., 2018), and public participation is valued less in countries where the political culture is less open and democratic (Chen, 2013; Purnama, 2003). For example, decision-making culture in Iran is centralised, which hinders the development of public participation. Public participation is therefore constrained by contextual factors that have more influence in authoritarian systems and developing countries than in Western and developed countries (Kolhoff et al., 2009) where it is common practice for the main stakeholders to be involved in the EIA process. This means a legal requirement is not the main driver for public participation as South Africa has extensive provision for public participation and access to global information, but in practice it cannot be described as a mature democracy (Morrison-Saunders and Retief, 2012).

Interviewees identified improved public participation as a practical measure that could lead to increase EIA effectiveness, on the basis that people are the most important stakeholders. It was suggested that NGOs and media are already playing a leading role in increasing public participation

by raising stakeholders' awareness about potential environmental and socio-economic impacts of mega development projects. However, there is no legal requirement for public participation in Iran's EIA process (Ahmadvand et al, 2009; Nouri and Nikoomaram, 2005; Moradi, 2009). Nevertheless, this shortfall shouldn't prevent public participation. Moreover, there is no transparency in Iran's EIA process as EIA reports are treated as confidential documents, so they are not visible for the public to comment on (Khosravi et al, 2019). These interviewees saw an important first step as being the EIA Bureau granting access to the EIA reports to the public. One interviewee from the EIA Bureau said they have a plan to allow public access the EIA reports in the DoE library and it might be a first step towards transparency. Fischer (2005) supports those recommendations in saying a transparent and clear process is an important precondition for effective participation.

10.2.4 EIA follow-up in improving EIA in Iran

Interviewees confirmed there is no mandatory requirement for implementing monitoring. In their opinion this was as a result of inadequate staff and equipment required for inspection. They also believed that staffing of the DoE and EIA authority depends on allocated funding, a similar finding in the case of India where understaffing did not allow EIA follow-up to be implemented effectively (Jha-Thakur, 2011).

Monitoring is expensive and requires qualified and experienced personnel (Badr, 2009), but the necessary financial resources are very limited in many developing countries (Marara et al. 2011). Limitations include the number of skilled staff (human capacity), the allocation of budget (resource capacity) and available technical capacity of the EIA actors (Van Loon et al., 2010 Marara et al.2011; NCEA, 2014). However, those capacities differ significantly across the proponents, and the need for proponents to support follow up in Iran was mentioned by the interviewees. Some interviewees usefully suggested that proponents should support the follow up in Iran. This can be achieved either by securing funding from government or by imposing follow-up fees on the project proponent under the principle of polluter pays.

10.3 Feasible recommendations to improve EIA effectiveness in Iran

Discussion shows that Iran's EIA enhancement needs a phased approach of capacity development programmes and it should be started with organisational capacity development. As participants suggested raising environmental awareness of decision makers (The sector ministries and parliament) and changing their way of thinking about environment is a fundamental contextual factor to strengthen in EIA legislation. They also mentioned increasing the environmental awareness of public and main stakeholders is the requirement for initiating public participation. Capacity building and training main EIA actors including EIA authorities, consultancies, universities and proponents is also necessary. However, implementation of these recommendations depends on the willingness and leadership (organisational capacity) of Iran's EIA authority, which is the most important sub component of capacity building. It seems Capacity building has the potential to be a comprehensive solution for Iran's EIA system. Potter and Brough clearly refute the idea that capacity building equals training by introducing different levels of a capacity pyramid (Figure 10.1) (Kirchhoff, 2006: 8–9). Capacity building is a broad concept including various sub capacities and training is the starting point of capacity building (Partidário, 2005; Kolhoff et al., 2018). Kirchholf (2006) introduced a framework to get insight into all capacities used by the EIA authority in Brazil and stated that Capacity development is an umbrella concept with some measurable sub categories including: Institutional capacity, organisational capacity, human capacity, scientific capacity, technical capacity, and resource capacity (Figure 10.1) (Kirchhoff, 2006: 8–9).

van Loon et al. (2010) have further explained these sub-capacities as follows: Institutional sub-capacity refers to the rules of the game (Lusthaus et al., 2002: 24) which is EIA specific rules. Organisational capacity refers to willingness and leadership (Baser and Morgan 2008; Kolhoff et al., 2016). Human capacity is about the qualification and number of all EIA actors including EIA authorities, private sectors, knowledge institutes (such as universities), environmental NGOs, the public, and the media. Technical capacity is about availability of Information and Communication Technology (ICT) and EA execution methods are central aspects of technical capacity and Resource capacity can be measurement equipment, e.g. cars to site visits (van Loon et al., 2010).

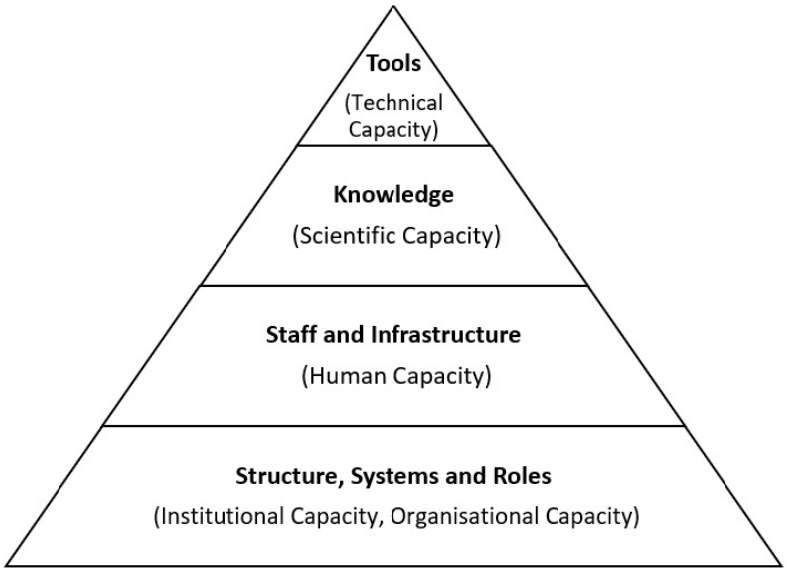

Figure 10.1. Capacity Pyramid,

Adapted from Potter and Brough (2004), Kirchhoff (2006) and van Loon et al. (2010), Khosravi et al. (2019b)

van Loon et al. (2010) argue that the most important issue about these sub capacities is that EIA capacity should not focus only on one isolated sub capacity as it does not solve EIA capacity problems. There are some countries with strong EIA legislation and weak implementation. However, the contextual factors especially the political system determines, which capacities can be enhanced (Kolhoff et al., 2018). This was observed in the case of Iran where there was no political will to introduce EIA law the visions of sector ministries and parliament members are the main driver which hinders strengthening the EIA legislation. van Loon et al. (2010) also discuss that the lower levels of pyramid are socio-culturally grounded and harder to implement. The result of interviews confirms this argument. Thus, following the advice of Kirchoff (2006) and Van Loon et al., (2009), organisational capacities (willingness and leadership) should be regarded as the most important of these recommendations as this sub capacity can ensure that other capacities such as human capacities, skills and access to funds are developed (Kolhoff. 2016).

It may seem that completing the lower levels of the capacity pyramid are a precondition for the upper levels, but not in Iran where increasing the human capacity of different groups of actors would appear to be needed in order to underpin efforts to strengthen EIA legislation. Thus, as argued EIA enhancement Iran needs a phased approach to include all sub- capacities and organisational capacity needs to be prioritised. In doing so, the effort should be focused on human capacity including raising awareness, education among the public, staff expansion and training. Parallel to increasing organisational, and human capacity, third phase of activities should be towards strengthening EIA legislation.

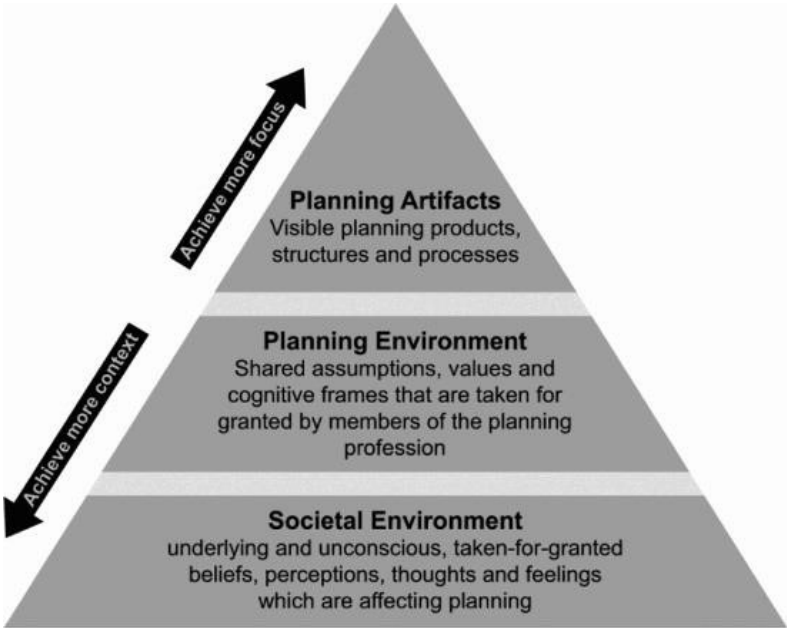

Figure 10.2. The culturized planning model

Othengrafen (2010) and Knieling and Othengrafen (2015)

This result is in line with the culturized planning model (Figure 10.2) proposed by Knieling and Othengrafen (2015). This model confirms that societal beliefs, thought and perceptions affects the planning system. This was argued by some interviewees as they mentioned that in the current political and socio-economic situation of Iran, raising awareness and changing the way of thinking is a precondition for delivering upper levels of the capacity pyramid. Adams (2008) argues that the publics' increased awareness can influence the planning approach and general governance towards

more communicative forms of planning. It means planning systems are bound to situation-specific contexts and are strongly influenced by 'socio-economic, political and cultural traits' (Knieling and Othengrafen 2015). Therefore, increasing the awareness and willingness of citizens and decision makers can provide grounds for changing EIA legislation even affecting the planning system.

10.4 Chapter Summary

In this chapter, the feasibility of implementing initial recommendations to enhance Iran's EIA system were assessed. In doing so we have taken into account the contextual factors influencing the EIA system in Iran. The result shows that development of an EIA system is not a linear process multiple dimensions need to be considered in developing an EIA system. Our assessment suggests that Iranian EIA authorities put their focus almost entirely on strengthening EIA legislation in the hope that this will solve current problems. However, reflecting on experiences elsewhere, it is unlikely that this will lead to success in the absence of political will and an underdeveloped awareness of environmental issues. Also, there is currently no appetite amongst Iranian key actors (members of parliament and sector ministers) to change EIA's legislative framework. Raising environmental awareness, changing the vision of key actors and ways of thinking of the various stakeholders about the environment is going to be a precondition for being able to strengthen EIA legislation.

It was identified that capacity building is of particular importance for addressing shortcomings of EIA, which could offer an overall comprehensive solution. In this context, capacity building should not be approached in isolation. What is of crucial importance is to consider all levels of the "capacity pyramid". Completing the lower levels of the pyramid including institutional capacity (EIA legislation) is a precondition for effectively delivering upper levels. However, in the case of Iran, enhancing human capacity of different groups of actors is needed in order to underpin efforts to strengthen EIA legislation. For example, increasing environmental awareness and changing the vision of sector ministries and parliament are essential precursors. Therefore, the first phase of capacity development should focus on feasible and short-term sub-capacity development (the upper levels of pyramid like training), whilst in parallel strengthening EIA legislation as a long-term sub-capacity

phase. Following this, attention will need to be paid to interpreting human capacity problems. The EIA Bureau and their willingness (organisational capacity) will play a key role in facilitating this. Further research is required in order to be able to assess and score different sub-capacities and find an inter-relational manner to produce more effective capacity guidance.

11 Conclusions and future research

This chapter draws out the final conclusions from this research and it has been divided into four sections. The first section summarises the main conclusions of the thesis as they are related to the four objectives outlined in Chapter 1. The second section reflects on the main contributions of this research to academic literature. The third section focusses on the limitations of the research. Following this, recommendations for future research are provided.

11.1 Evaluation of aim and objectives

The central aim of this research was to review Iran's EIA system and examine its effectiveness in Iranian water management sector. In order to address this aim, four subsidiary objectives were set to structure the literature review and the research activity.

1. To review the status of the EIA system in Iran and identify its strengths and deficiencies.
2. To develop a framework of EIA effectiveness criteria for the Iranian water management sector.
3. To examine the effectiveness of the EIA system in ULB.
4. To develop recommendations to enhance EIA effectiveness in Iran and assess the feasibility of these recommendations with considering Iran's contextual factors.

This section summarises the extent to which the priorities set in each of the research objectives have been addressed.

11.1.1 Objective 1: To review the status of the EIA system in Iran

In Chapter 7, the Iranian EIA system was reviewed against criteria adapted from Nadeem and Hameed (2008), focusing on EIA legislation, administration and processes. Data were collected using document analysis and semi-structured interviews. Findings indicate several weaknesses in the Iranian EIA system in the following three categories:

Legislative provision for EIA: The legal basis for EIA in Iran is as a part of the NDP, and this is found to be insufficient and existing EIA legislation is established to be a weakness in Iran. Furthermore,

the country lacks effective penalties, in that they are too low and frequently not enforced, which further weakens the legislation.

EIA process: There are currently several problems with Iranian EIA processes. These include deficiencies in screening and scoping, public participation, alternative consideration, and EIA follow-up.

EIA Administration: Many of the deficiencies arising in the Iranian EIA process are connected to insufficient human capacity building, particularly a shortage of qualified personnel. Iran is currently at a low level of maturity and still "*learning about EIA*". Therefore, training needs to be urgently prioritised, it is vital to develop capacity for EIA actors including DoE staff, consultants, developers, NGOs and universities. These measures are needed to improve EIA stages such as screening, scoping, EIA reviewing, monitoring and inspection.

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11.1.2 Objective 2: To develop a framework of EIA effectiveness criteria

An EIA effectiveness framework was developed from a review of the international literature review of EIA effectiveness (Chapter 3) and an assessment of the Iranian EIA system (Chapter 7). The framework primarily focused on aspects of procedural and substantive effectiveness and was designed to consider contextual factors. Contextual factors that constrain the Iranian EIA system were identified during the first round of interviews and then applied in the framework of analysis to examine the EIA effectiveness.

11.1.3 Objective 3: To examine the effectiveness of the EIA system in ULB

The effectiveness of EIA in Iranian water management has been examined in Chapter 8. The ULB was used as a study area and the extent to which EIA appears to be delivering environmental protection objectives was established. Data collection included document analysis of EIA reports, semi-

structured interviews and site visits. Within the ULB only three dam projects were identified to have included an EIA and where EIA reports were available. These three EIA reports were studied as part of the document analysis. The first round on interviews was aimed at the national level, and this second round of interviews shifted the focus to the provincial level. The contextual factors established in the first round of interviews were explored in further detail in the twenty interviews that were carried out with local EIA and water experts at ULB. Chapter 8 revealed that environmental assessment in Iranian water management is currently restricted to the project level and that the current EIA system is neither procedurally nor substantially effective, as it is not able to address and mitigate the larger effect of extensive dam-building.

The 10-year Urmia Lake Regional Plan to restore the Basin was also investigated and it was revealed that despite the existence of legal requirements for the assessment of policies, plans and programs in the 5th NDP since 2010, no SEA study has been conducted for the ULRP.

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Khosravi. F, Jha Thakur, U. Fischer. TB. 2018. "***The role of Environmental Assessment (EA) in Iranian water management***". Journal of Impact Assessment and Project Appraisal. http://dx.doi.org/10.1080/14615517.2018.1526998.

11.1.4 Objective 4: Recommendations to enhance Iran's EIA effectiveness

Recommendations were provided in two different sections. In first section recommendations to enhance the EIA effectiveness in Iran were prepared in two categories of procedural and substantive effectiveness. These recommendations were then assessed according their feasibility of implementation by adapting them to the country's contextual factors. Capacity building was identified of particular importance for addressing shortcomings of EIA, which could offer an overall comprehensive solution. In this context, all levels of capacity building pyramid should be considered. This feasibility assessment of recommendation revealed that attempts to develop EIA systems further need to start by critically reflecting on country-specific context and capacities. Various

authors have argued that Iran's EIA system is in urgent need of improvement. Not only is Iran's legal situation problematic, but the wider context including organisational, institutional and human capacities pose major challenges.

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Khosravi. F, Jha Thakur, U. Fischer. TB. 2019. ***"Enhancing EIA Systems in Developing Countries: A focus on capacity development in the case of Iran".*** Science of the Total Environment. 670: 425-432.

11.2 Contributions to academic literature

This thesis contributes the following new knowledge to academic literature:

- This research fills important research gaps on a timely environmental issue, providing an evaluation of the Iranian EIA system, focusing on EIA legislation, administration and processes (Chapter 7). Although EIA was formally introduced in Iran nearly a quarter of a century ago in 1994, to date there has been little EIA-related research undertaken in the country (Khosravi et al. 2019a). This evaluation was based on the comprehensive criteria framework developed in Chapter 2. The introduction and evaluation of the Iranian EIA system that is provided here may serve as a starting point for researchers interested in this area.
- The second major scholarly contribution of the thesis has been to explore the environmental consideration at plan and project level in the ULB, a vital lake at national and international level. The water management issues of ULB have been researched from various perspectives, including by Ahmadaali et al. (2018), AghaKouchak et al. (2015), Govarchin Ghale (2018), Shadkam (2017) and Soudi et al. (2017). However, to date no research has been conducted on the consideration of environmental issues during water resource planning processes (Khosravi et al. 2018). This research criticises the EIA effectiveness within Iranian water management in this basin based on a developed criteria framework in Chapter 8 and concludes that the current EIA system is neither procedurally nor substantively effective, as it is not able to address and mitigate the larger effect of extensive water development (Khosravi et al. 2018). SEA could contribute to

avoiding such disasters in ULB and other basins. The result of this section reminds some externalities of drying lakes.

- Last but not least, it must be noted that this research tested the feasibility of the provided recommendations on the basis of Iran's contextual factors. Assessing the feasibility of recommendations in Chapter 10 proves that providing recommendations to improve an EIA system in any country needs to start from the country-specific context and its capacities. This section of the research revealed that suggesting recommendations only based on weaknesses identified during a research study and taking inspiration from other developed countries without considering their feasibility in the light of the adapting context of developing countries are not practical recommendation. For example, one of the main drawbacks of the Iranian EIA system which was identified in previous chapters is deficiency of EIA legislation. However, based on the findings of a review of the literature and semi-structured interviews, it is suggested that by considering contextual factors it is not feasible to overhaul Iran's EIA legislative framework in the short term. Instead, the focus must shift towards increasing environmental awareness and human-capacity development so as to improve the EIA system over time and strengthen EIA legislation. It's not in the case of Iran and considering EIA system's context should be a precondition for being able to suggest recommendation to improving that system. These findings are expected to be useful for guiding policy actions by other researches in the future.

11.3 Limitations of this research

An important limitation of this study is related to the document analysis. Access to the majority of the documentation on EIA is compromised because this information is not easily available on the websites of the DoE. Furthermore, due to confidentiality of EIA reports, lack of transparency in Iran's EIA system and bureaucratic processes embedded in the environmental agency accessing EIA related documents is challenging.

11.4 Recommendations for further research

This research examines the effectiveness of EIA in Iranian water management within the context of the Urmia Lake Basin. Whilst the Basin and its context are unique, the analysis used in this study may be applied to other basins to further substantiate the claim that Iran's EIA system is not working effectively and not delivering environmental protection to the water management sector. As mentioned in Chapter 5, ULB is not the only visible symptom of the defective water management system in Iran (Madani, 2014). There are other lakes and wetlands that have lost their environmental health due to the cumulative effects of development projects. Moreover, this research is sector specific and focussed on the water sector due to the water crisis in Iran, although the results represents EIA practice in Iran to some extent; other sectors would need to be evaluated for a more comprehensive result on EIA effectiveness in Iran and especially the oil sector is highly recommended due to having an oil-based economy in Iran.

This research revealed other aspects that may be suitable for further study. It was found that water management in Iran should shift from structural solutions to non-structural solutions, including SEA and EIA, to prevent serious environmental degradation. This research pointed to issues with procedural and substantive effectiveness, but other aspects of EIA effectiveness like transactive effectiveness are potentially also of research importance.

This research also proves that sensitivity to an EIA system's context is a precondition for being able to suggest recommendations in improving that system. Although, providing recommendations to improve an EIA system based on the identified deficiencies is the fundamental step, it is completed by considering the country's contextual factors. Moreover, this improvement needs a phased approach. For example, one of the main drawbacks of the Iranian EIA system identified in this research is deficiency of EIA legislation. Hence, at first it was recommended that the legislative requirement of EIA in Iran be enhanced. However, based on the contextual factors and stakeholders' perceptions, it was suggested that it is not feasible to overhaul Iran's EIA legislative framework in the short term. Instead, the focus must shift towards increasing environmental awareness and human-

capacity development so as to improve the EIA system over time and strengthen EIA legislation. It was proposed that EIA enhancement in Iran needs a phased approach to include all sub-capacities and organisational capacity needs to be prioritised. In the second phased more effort should be focused on human capacity and the third phase of activities should be toward strengthening EIA legislation. Further research is needed to understand human capacity problems, assess and score different sub-capacities, and find ways to produce more effective capacity guidance.

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13 Appendices

13.1 Appendix A: First Interview Scheme

The potential for Environmental Impact Assessment (EIA) in Iran's Water Management sector

Name of the Interviewee

Department and Organization

Phone

Email

Interview Date

Start time

Finish time

Introduction

What is your role regarding EIA?

How long have you been working in EIA?

What is your education background?

What barriers do you have in your role?

1. EIA legislation

1.1. Is there EIA- specific law or is EIA a part of another law? Do you think it is sufficient for conducting EIA?

1.2. Are steps of the EIA process specified in regulations as mandatory steps?

1.3. If proponents go ahead their projects without EIA approval, would there usually be judicial review (Is there any penalty in case of violating the law)?

2. EIA administration

2.1. Which organisation is responsible for making regulations and providing EIA guidance in Iran?

2.2. Which organisation is responsible for reviewing EIA reports?

2.3. Which organisation is responsible for inspecting EIA implementations?

2.4. Is EIA centralised at the national level in Iran?

3. EIA process

3.1 Specified screening categories

- What kinds of projects are required to do EIA?
- How is screening step conducted in Iran?

3.2 Systematic scoping

- How is scoping step conducted in Iran?

3.3 Requirement to consider alternatives

- Are environmental impacts of alternatives considered in the EIA process?

3.4. Public participation in EIA process

- How public participation considered during EIA process?
- Does public participation start from early stage of scoping?

3.5 EIA report review and EIA approval

- How is EIA approval process? Does it take too much time?

- Is there any time limit for the EIS review and approval by EIA Bureau?
- Is EIA approval influenced by political and economic pressures?

3.6. Mitigation measures

- Do mitigation measures are implemented?

3.7 Monitoring

- When EIA approved, is monitoring literally implemented in Iran?

3.8. Inspection

- Is inspection literally happened in Iran?

13.2 Appendix B: Participant Information Sheet

Fatemeh Khosravi
PhD Student
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School of Environmental Science
Department of Geography and Planning
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1. Research Title

The potential for Environmental Impact Assessment (EIA) in Iran's Water Management sector

2. Invitation paragraph

You are being invited to take part in a research study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and feel free to ask us if you would like more information or if there is anything that you do not understand. Please also feel free to discuss this with your friends and relatives if you wish. We would like to stress that you do not have to accept this invitation and should only agree to take part if you want to. Thank you for reading this.

3. What is the purpose of the study?

This survey is part of a PhD research which is being undertaken by Fatemeh Khosravi. The aim of this study is to examine the role of EIA is currently playing in addressing problems of inadequate water management in Urmia Lake Basin through planning of dams and to investigate what is needed to enhance EIA's effectiveness as a decision support tool within Water Management practices. In order to achieve the aim, we need to understand the status of EIA in Iran and status of EIA in Urmia Lake Basin, which is not achieved merely by literature review. It is needed to interview EIA actors in Iran.

4. Why have I been invited to participate?

You have been invited to participate in this research because you were identified as a key actor. It means you might have important information and opinions which will help me to achieve the aim of this study. Key actors were chosen from the following spheres: Ministry of Energy, Department of Environment, EIA consultancies and NGO in Iran.

5. Do I have to take part?

Your participation would be very beneficial for my study as your knowledge, opinions and point of views would help to build up my thesis and to achieve its aim. However, taking part in this research is entirely voluntary. It is up to you to decide whether to take part. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a consent form.

6. What will happen if I take part?

If you decide to participate you will be invited to take part in a semi-structured interview which will be audio-recorded with your authorisation. Each interview will be carried out at your workplace and it will not last more than 30 minutes.

7. What are the possible risks of taking part?

There is no potential risk to participants. However, if the participants should experience any discomfort or disadvantage as part of the research this should be made known to the researcher (Fatemeh Khosravi) immediately.

8. What are the possible benefits of taking part?

If you decide to take part, you will be contributing with your knowledge to provide a better understanding of the relationship between dams' planning process and EIA system and also weakness of EIA system in Iran. In addition to this, we will provide you with the outcome of the research which we hope would assist you in improving EIA for future.

9. What if I am unhappy if there is a problem?

If you are unhappy, or if there is a problem, please feel free to let us know by contacting Fatemeh Khosravi (Principal Investigator) on khosravi80@liverpool.ac.uk. If you remain unhappy or have a complaint which you feel you cannot come to us with then you should contact the Research Governance Officer at ethics@liv.ac.uk. When contacting the Research Governance Officer, please provide details of the name or description of the study (so that it can be identified), the researcher(s) involved, and the details of the complaint you wish to make.

10. Will what I say in interview be kept confidential?

All information collected during the interview will be kept strictly confidential. All data collected during the field studies will be kept on the university password protected secure server 'M' drive. Therefore, it will be anonymised.

The data collected will only be accessible to the project team. The team consists of:

- Fatemeh Khosravi (Principal Investigator)
- Dr. Urmila Jha Thakur (Primary Supervisor)
- Prof. Thomas Fischer (Secondary Supervisor)

The data collected will be kept for a period of five years and then disposed of in-line with University of Liverpool Protocol.

11. What should I do if I want to take part?

Please feel free to email khosravi80@liverpool.ac.uk to confirm your interest. I can then arrange a convenient appointment for you.

12. What will happen to the results of the research study?

The results of the research will be published in my thesis and also in conference and journal articles. You will not be identifiable from the results and the researcher will be happy to share your transcript with you if you desire.

13. What will happen if I want to stop taking part?

You can withdraw at any time, without explanation. Results up to the period of withdrawal may be used, if you are happy for this to be done. Otherwise you may request that they are destroyed, and no further use is made of them.

14. Who can I contact if I have further questions?

Please feel free to contact the researcher, Fatemeh Khosravi, at any time during the study.

We would like to thank you for your time considering this request.

Yours faithfully,

Fatemeh Khosravi

13.3 Appendix C: Participant Consent Form

Research Project Title	**The potential for Environmental Impact Assessment (EIA) in Iran's Water Management system**
Researcher	**Fatemeh Khosravi**

I confirm that I have read and have understood the information sheet dated [DATE] for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my rights being affected. In addition, should I not wish to answer any question or questions, I am free to decline.

I understand that, under the Data Protection Act, I can at any time ask for access to the information I provide, and I can also request the destruction of that information if I wish.

I understand that confidentiality and anonymity will be maintained, and it will not be possible to identify me in any publications.

I understand and agree that my participation will be audio recorded and I am aware of and consent to your use of these recordings for use in writing up and publishing the study findings.

I agree for the data collected from me to be used in relevant future research.

I understand that my responses will be kept strictly confidential. I give permission for members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the report or reports that result from the research.

I understand and agree that once I submit my data it will become anonymised and I will therefore no longer be able to withdraw my data.

Participant Name	Date	Signature
Name of Person taking consent	Date	Signature
Researcher	Date	Signature

Principal Investigator:

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[Version 1.0; 1st June 2017]